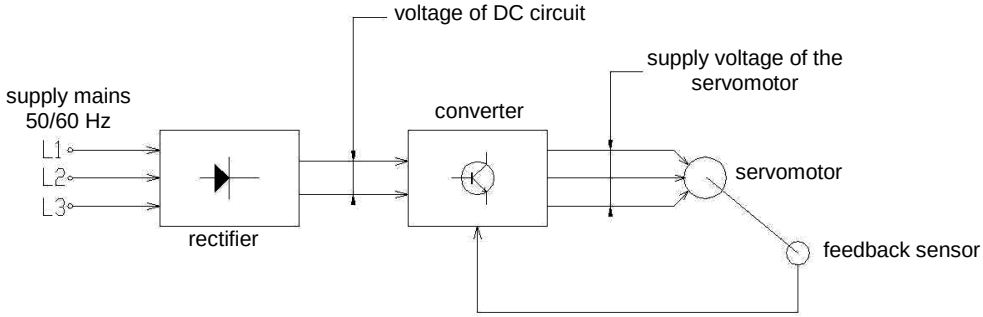
AC servomotors with permanent magnets

General

AC servomotors with permanent magnets are intended for up-to-date electronically controlled electric drives with a wide control range, good dynamical properties and a high precision and can be applied in the field of mechanization and automation of manufacture, packaging technique, etc. These servomotors are three-phase synchronous motors with excitation by permanent magnets on the rotor operating as brushless DC electric motors. This function of the motors is ensured by transistor converters with DC intermediate circuit and feedback control by a position sensor (e.g. resolver) embedded in the servomotor.
Basic diagram of the drive with an AC servomotor :



AC servomotors with rare-earth permanent magnets with a high energy density have the following benefits in comparison with standard machines:

- small dimensions and masses
- low moments of inertia
- high torque overload capability
- high efficiency
- high acceleration in transient conditions

Other features of brushless AC servomotors are as follows:

- long service life and high reliability in operation
- minimum maintenance (no sliding contacts, bearings with permanent grease filling)
- mechanical dimensions in the precise class
- increased degree of protection IP65
- fixed bearing at the side of the shaft extension

Range of servomotors of the firm VUES Brno a.s.

AC servomotors are produced in two design modifications:

- **M series** – servomotors with a small ratio of diameters of the fixing flanges to the motor length (long motors)
- **F series** – servomotors with a high ratio of diameters of the flanges to their length (flat motors)

Both series are produced with power output parameters for natural cooling IC 00-41 in the torque range from 0,4 to 55 Nm, mostly with 6 poles. We have been producing also machines with the number of poles 4, 8, 10 and 16.
Besides the basic version the servomotors of M series are made also in modifications for separate cooling, e.g.:

- **W series** – consists of several types of the servomotors of M series modified for separate water cooling ICW37-A41; higher permanent torques and power outputs are achieved while maximum values of currents and torques are not changed

- **ML series** – consists of several types of the servomotors of M series modified for the cooling by surface air flow from a separate fan IC 06-41, also with higher permanent torques and power outputs
- **ME series** – consists of the servomotors of M series intended for built-in version
- **FE series** – consists of the servomotors of F series intended for built-in version
- **MA series** – consists of servoactuators based on the servomotors of M series. It is a standard series of servomotors with a hollow shaft into which a ball screw is built. This design enables transmission of rotating to linear movement to be achieved while maintaining small outside dimensions.

All types of the servomotors can be delivered also in the version with integrated electromagnetic safety brake.
Servomotors are produced for three voltages of DC intermediate circuit 120, 330 and 560 V DC, r.m.s. values 70, 190 and 330 V AC being determined as rated supply voltage of servomotors U_1. The servomotors with intermediate circuits of the voltage 560 V DC are provided with reinforced phase insulation. The servomotors were designed for being supplied from converters of the firm Bautz, they can be supplied, however, also from converters of other firms.
The rated speed of servomotors is determined for the rated voltages given above and for the fixed range of voltage constants K_E being given in the servomotor type (see Ordering of servomotors).
The German firm Eduard Bautz GmbH is an exclusive supplier of these servomotors into EU countries on the basis of a contract. Further export of servomotors delivered to the Czech market into these countries is therefore inadmissible or possible only by agreement with the producer of servomotors.

Notes:

- Rated values (M_n, P_n) depend on the type of the supply converter being used and on the possibility of removing the motor losses through its flange. For the M series there is recommended roughly a minimum additional cooling area to which the motor is attached by means of its flange and which is given by the square of the side a = 2,5 x dimension of M servomotor. The temperature of the motor flange must not exceed +90° C in operation.
- For the servomotors of F series the dimensions of the cooling area are prescribed as follows:
  - F50 – F63 : 300 x 300mm
  - F80 – F100 : 400 x 400mm
- The binding values can be determined only for concrete combinations of the servomotor and the converter and for the relevant application of the drive.
- In case of the servomotors of W and ML series the rated parameters are binding for the rated cooling (without additional cooling areas).
- The tolerances of technical data being valid for servomotors with permanent magnets are +10 %. These tolerances, in addition to the manufacturing tolerance, include also the tolerances of parameters of permanent magnets, their thermal dependence and influence of temperature rise of the servomotors at the load.

General technical data of the basic version of servomotors

Types of construction and version of servomotors

- Type of construction of servomotors – according to ČSN EN 60034 -7
  - IM B5 (IM 3001)
  - IM V1 (IM 3011)
  - IM V5 (IM 3031)
- Version according to degree of protection
  - podle ČSN EN 60034-5
  - IP65 as a standard – with the exception of the shaft extension
  - IP65 by request including the shaft extension (with a sealing ring)

Cooling of servomotors

- basic version – M and F series – IC 00-41, i.e. closed, with natural cooling of the servomotor surface
- special version – W series – ICW 39-A41, i.e. water cooling in the servomotor frame
- special version – ML series – IC 06-41, i.e. closed, with cooling by air flowing over the servomotor surface from a separate fan being a part of the servomotor

Working conditions

The servomotors are designed for stationary applications at the places being protected against weather influences and for environmental conditions IE 34 according to ČSN EN 60721-3-3. Among others, the basic conditions are as follows:

- ambient temperature +5 to +40° C
- relative humidity 5 to 95 %
- altitude above sea level up to 1000 m (pressure 90 kPa)
- water cooling must be realized with treated water without mechanical impurities. The recommended hardness of water is 0,7 mmol/l. If necessary, water softening agents must be used. The recommended acidity of cooling water is in the range of 6,5 – 7,5 pH. The inlet water temperature is +5 to +25° C. The cooling water quantity is from 1 l/min to 2,5 l/min at the pressure drop from 1 to 10 kPa, according to the servomotor size. The cooling system is designed for the maximum pressure of 1 MPa.

Other technical data:

- Thermal insulation class „F“ according to ČSN 35 0000, Part 1, maximum temperature rise of the winding $\Delta \vartheta = 105$ K
- Three-phase winding in star-connection without neutral being brought out
- Thermal protection
  - one thermal switch +135° C (opening contact) located in the end winding between two phases
  - by request also other sensors, e.g. PTC etc.
- Connection of the motors to the converter:
  - power outlets: by means of a 6-pole connector, in the sizes with higher power outputs M71, M90 by means of the terminal board
  - signal outlets: by means of a 12-pole connector
  - by request outlets by the cable
- Dimensions of flanges and their tolerances
  - according to ČSN IEC 72 – 1 (350040) with the exception of the size M25
  - run-out of the shaft extension – precise class „R“ according to DIN 42955
  - axial alignment of the centring step diameter and perpendicularity of the flange seating face with regard to the shaft – precise class „R“ according to DIN 42955
- Shaft extensions
  - cylindrical without keyways with dimensions according to ČSN IEC 72 – 1, clause 7
  - by request also with keyway and feather according to the same standard
- Permissible axial and radial loads in the middle of the shaft extension for the specified average speed of the motor are given for individual types of motors in the tables of technical data of servomotors. More detailed information will be given by request.
- Rotor mounting – ball bearings with permanent grease filling for the service life ≥ 20 000 hours
- Vibration
  - highest permissible values in the whole speed range (measured according to ČSN 350000, Part 14)
  - V_{ef} = 1,8 mms^{-1} at the places according to the standard
  - V_{ef} = 2,8 mms^{-1} at any place and any direction of vibration
- Surface finish
  - varnishing, black colour
  - by request surface finish for food-stuff industry (Krautoxin, black colour)

Feedback sensor

As a standard the servomotors are delivered with a two-pole resolver located at the front side of the servomotor (it is accessible after removing the front cover). In the basic version resolvers with the input voltage of 7 V_{ef} , 10 kHz are applied.

By request of the customer it is possible:

- to use the type of resolver according to the requirement of the customer
- to modify the shaft at the front side of the servomotor with regard to an additional mounting of another sensor (e.g. of the firms Heidenhein, Stegmann, etc.), or mounting of a sensor other than resolver: (SinCoder, DiCoder, incremental sensor).

Safety brakes

The servomotors of all types being delivered can be ordered in the version with an integrated electromagnetic safety brake. The function of the safety brake consists in locking the rotor of the servomotor in a certain position until DC supply voltage of 24 V is connected to the brake coil. The brake can be connected and disconnected only when the rotor – drive is at rest.

The servomotors of M series have safety brakes of the type MY built in the motor frame at the rear side (at the shaft extension). The brakes are made of half-finished products of the firm MAYR. In the type size M90 a built-in version of the brake of the firm Binder is used. In the servomotors of F series there are used original brakes of the firm MAYR being mounted under a special cover at the front side of the servomotor (behind the resolver). When the resolver is adjusted in these motors the brake must be dismantled.

Instructions for assembly and operation of servomotors

Mounting of rotors of the servomotors is rated for the service life longer than 20 000 hours. The mounting is very precise, requiring a careful handling. Particularly axial forces higher than the prescribed ones or even axial impacts at the shaft extension can damage bearings or sensors and decrease their service life. That is why in the axis of the shaft extension there is a threaded hole that can be used for the mounting of couplings, pulleys or pinions. These parts must be pulled down also very carefully (tools for pulling-down).

In the servomotors with built-in safety brakes it must be ensured that the safety brake is released during the starting of the motor; it is realized after the application of electric voltage to the winding of the brake coil (locking of the rotor is carried out mechanically – by means of springs).

The temperature of the servomotor surface reaches the value of approx. +100° C in the fully utilized machines. The operators must know it.

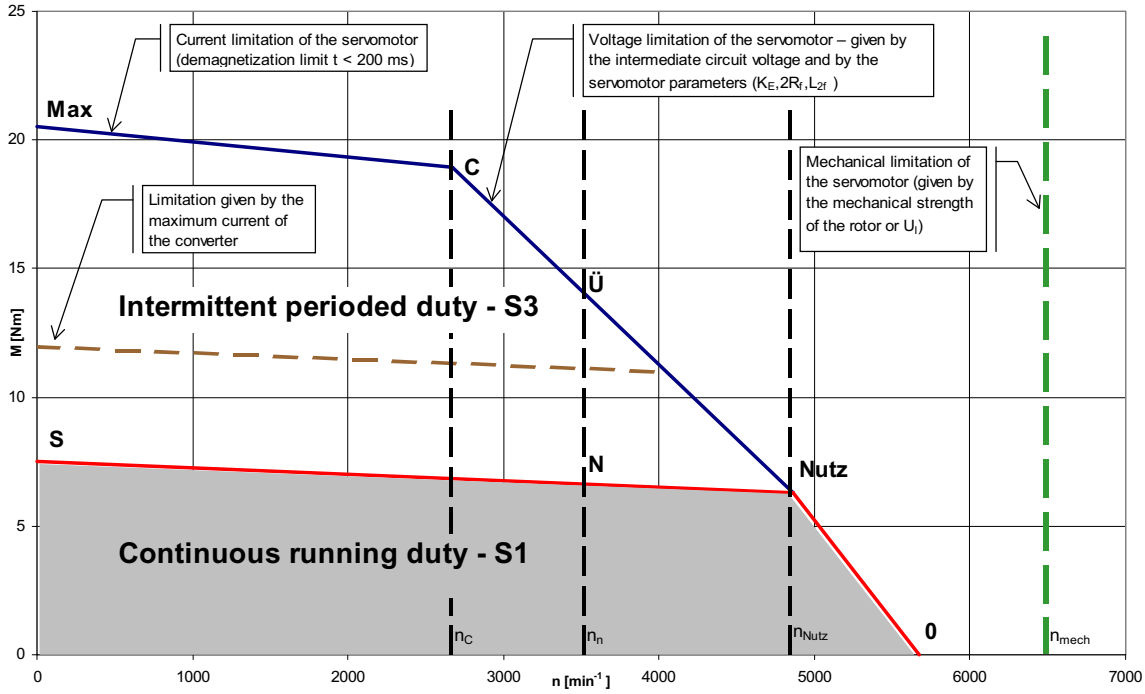
The servomotors can be stored in dry rooms at the temperatures –30° C to +85° C.

The shaft extensions must be protected against corrosion during the storage.

Torque-speed characteristic of AC servomotors

Generally the servomotors of M and F series are designed more for dynamical processes in the wide speed range with a variable load than for continuous running duties S1 with the constant load and constant speed. That is why the servomotors can be loaded by substantially higher torques (currents) than there are rated ones provided that their mean r.m.s. value does not exceed rated values for continuous running duty S1. From the electromagnetic point of view the motors are designed for 3,5 to 4 multiple of the torque overload capacity.

Torque-speed characteristic of AC servomotors



Used symbols

M_o [Nm] - standstill torque - torque on the servomotor shaft at zero speed for continuous running duty S1 (defined for temperature rise of the winding 105 K and for the rated value of K_E)

I_o [A] - standstill current - r.m.s. value of the servomotor current forstandstill torque M_o

k_M [Nm.A^{-1}] - torque constant $k_M = M_o/(I_o.\sqrt{3}) = k_e$ is defined for the temperature of the servomotor including magnets +20° C

U_1 [V] - rated maximum supply voltage of the servomotor

U_{NMOT} [V] - rated line-to-line voltage of the servomotor - r.m.s. value of the 1st voltage harmonic at M_N and n_N (defined for the rated value of K_E and winding heated to permissible rated temperature rise)

M_N [Nm] - rated torque - continuous torque on the servomotor shaft at n_N and U_N for continuous running duty S1 (defined for temperature rise of the winding 105 K and for the rated value of K_E)

I_N [A] - rated current - r.m.s. value of the servomotor current for M_N and n_N

n_N [min^{-1}] - rated servomotor speed

P_N [W] - rated power output on the servomotor shaft at M_N and n_N

$M_ü$ [N$_m$] - maximum torque overload capacity at the rated speed

M_{nutz} [N$_m$] - maximum usable continuous torque on the servomotor shaft at the supply voltage U_1

n_{nutz} [min^{-1}] - servomotor speed at M_{nutz}

P_{nutz} [W] - maximum continuous power output of the servomotor at the supply voltage U_1

K_E [V min^{-1}/1000] - voltage constant of the servomotor (rated value). r.m.s. value of line-to line induced electromotive force between two terminals of the servomotor at the speed 1000 min^{-1} and servomotor temperature +20° C

M_{max} [Nm] - maximum torque on the servomotor shaft at zero speed and the current I_{max}

I_{max} [A] - highest permissible servomotor current (r.m.s. value) at which the permanent demagnetization of magnets does not yet occur (t ≤ 200ms)

n_{max} [min^{-1}] - highest continuous permissible servomotor speed for which the rotor of the servomotor is mechanically dimensioned in hot state (or maximum permissible speed with regard to induced electromotive force in the check test)

R_{U-V} [Ω] - winding resistance between two terminals of the servomotor - corresponds to a double of the phase resistance at the temperature +20° C

L_{U-V} [H] - winding inductance between two terminals of the servomotor - corresponds to the inductance of two phases connected in series, measured at the frequency 1 kHz

J [kg.m^2] - intrinsic moment of inertia of the rotor with a resolver (without a brake)

m [kg] - mass of a standard servomotor including a resolver (without a brake)

F_A [N] - permissible axial loading of the shaft extension for continuous speed n_{mitt} and horizontal mounting

F_R [N] - permissible radial loading of the shaft extension (acting in the middle of the shaft extension length) for continuous speed n_{mitt} and horizontal mounting

n_{mitt} [min^{-1}] - mean speed of the servomotor for which the values F_A a F_R are determined

n_o [min^{-1}] - maximum speed in no-load operation of the servomotor at the rated supply voltage U_N

I_C [A] - maximum short-time permissible current (r.m.s. value) which is given by the intersection of current limitation of the servomotor and of limitation by the rated voltage of the converter – LIMITING POINT C; mostly I_C is identical with the highest permissible servomotor current ($I_{max.}$)

M_C [Nm] - maximum torque of the servomotor at the current I_C and speed n_C

n_C [min] - speed of the servomotor at I_C and M_C

Type Key

M	2 5	6	B	-	B	1	0	-	0	0	-	0	0	0

Type key of the series:

- M - standard series with low inertia
- F - series of flat motors
- W - water cooled motors
- ML - M motors with separate ventilation
- ME - built-in version of M motors
- FE - built-in version of F motors
- MA - servoaktuators (based on series M)
- AM - dynamic series
- AF - compact series
- AFE - built-in version of AF motors
- AML - dynamic series with separate ventilation
- AMA - servoactuators based on series M
- AMW - water cooled series AM
- AME - built-in version of AM motors

Shaft height [mm]:

M,W,ML,ME,MA - 25, 40, 50, 71, 90
AM, AML, AMA, AMW,AME - 25, 40, 50, 71, 90, 112
AF,AFE,F,FE - 56, 63, 80, 100

Code number of the motor length:

M,W,ML,ME,MA - 2, 4, 6, 8
AM,AML,AMA,AMW,AME- 2, 4, 6, 8
F,FE - 4, 6
AF, AFE - 2,3,4

Voltage constant K_E [V/1000.min^{-1}]:

- B - 8,5
- C - 15
- D - 25
- E - 30
- F - 45
- G - 50
- H - 60
- K - 70
- I - 90
- J - 100
- L - 120
- N - 150
- P - 200
- R - 250
- S - 300
- T - 500

Application of the brake:

- 0 - without brake
- B - with brake

Feedback sensor:

- 0 - without sensor
- 1 - resolver 9,5 mm
- 2 - resolver 8 mm
- 3 - res. Sagem 8 mm
- 4 - resolver 10 mm
- 5 - resolver 12,7 mm
- 6 - res. Sagem 12,7 mm
- 7 - Heidenhain
- 8 - Stegmann
- 9 - another sensor

Thermal protection:

- 0 - thermal switch
- 1 - thermistor NTC
- 2 - posistor PTC
- 3 - PT 100 + thermal switch
- 4 - thermal switch + thermal resistor
- 5 - without thermal sensor
- 6 - twice thermal sensor
- 7 - KTY

Version of shaft extension:

- 0 - without keyway
- 1 - with keyway
- 2 - special drilling
- 3 - special arrangement
- 4 - hollow shaft
- 5 - special arrangement with keyway (1 + 3)

Electrical connection of the motor:

- 0 - direct connector
- 1 - by cable
- 2 - free outlets
- 3 - terminal box
- 4 - special connector
- 5 - inner terminal box
- 7 - right-angle connector

Insulation system:

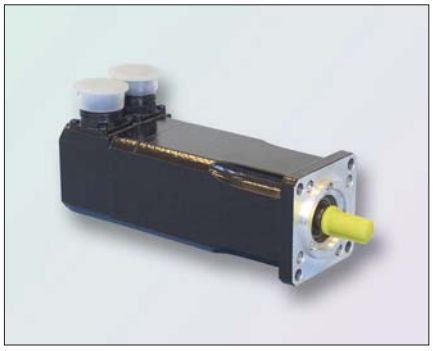
- 1 - 330 V_{DC}
- 5 - 560 V_{DC}
- 7 - 700 V_{DC}
- 8 - 800 V_{DC}

Special version:

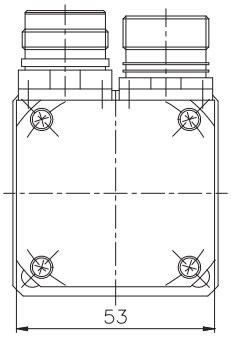
- 0 - IP 54
- 1 - IP65 without shaft extension
- 2 - special bearing assembly
- 3 - IP 65
- 4 - 3+special part
- 5 - special D-end shield
- 6 - atypical part
- 7 - 3+atypical part

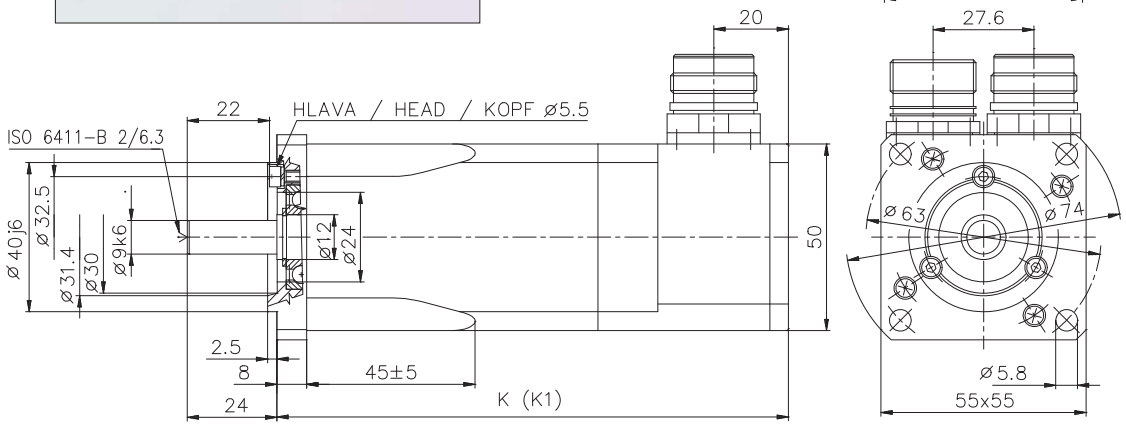
Surface finish:

- 0 - AMERLOCK black semi-matt
- 1 - surface finish for food industry
- 2 - black S2043/1999 semi-matt
- 3 - no painted



M 254
M 256
M 258





TYP SERVOMOTORU	MOTOR TYPE	MOTORTYP	M 254	M 256	M 258
K (bez brzdy)	**K** (without brake)	**K** (ohne bremse)	137	152	182
K1 (s brzdou)	**K1** (with brake)	**K1** (mit bremse)	170	185	215

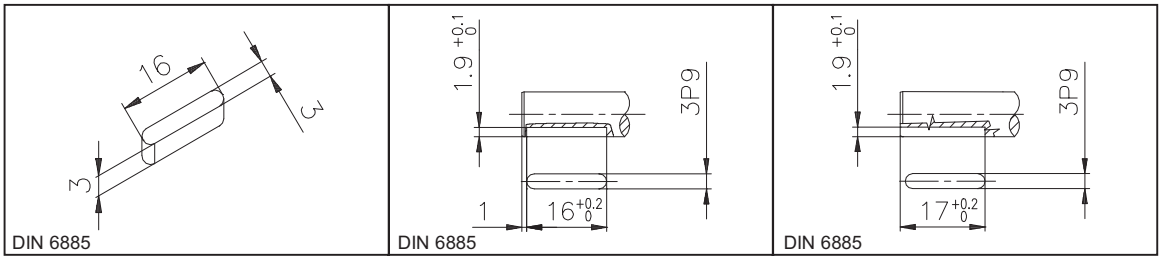
♦ Brzda ♦ Brake ♦ Bremse ♦

SERVOMOTOR	M_0 [Nm]	MAYR	M_B [Nm]	t_{1max} [ms]	t_{2max} [ms]	U_{1DC} [V]	n_{max} [min^{-1}]	J [$kg.m^2.10^{-3}$]	m [kg]
M 254 - B	0,4								
M 256 - B	0,6		0,5	30	20	24	12300	0,0028	0,25
M 258 - B	0,9								

M_B - brzdný moment / holding torque / Haltemoment;
J - moment setrvačnosti / moment of inertia / Trägheitsmoment;
m - hmotnost / weight / Gewicht;
n_{MAX} - max. otáčky / max. speed / max. Drehzahl;

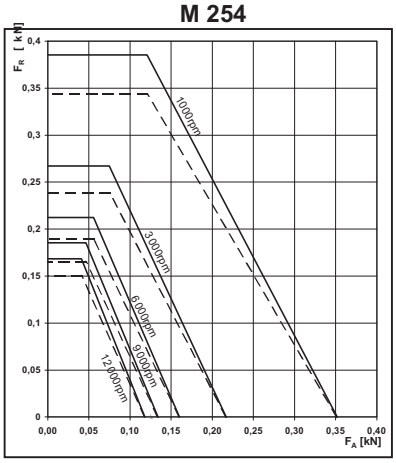
t_{1MAX} - max. čas sepnutí (odbrždění) / max. time of switching-on (brake release) / max. Einschaltzeit (lösung der Bremse);
t_{2MAX} - max.čas rozepnutí / max.time of switching-off / max.Ausschaltenzeit;
U_{1DC} - jmenovité napětí / rated voltage / Eingangsspannung;

♦ Hřídel ♦ Shaft ♦ Welle ♦

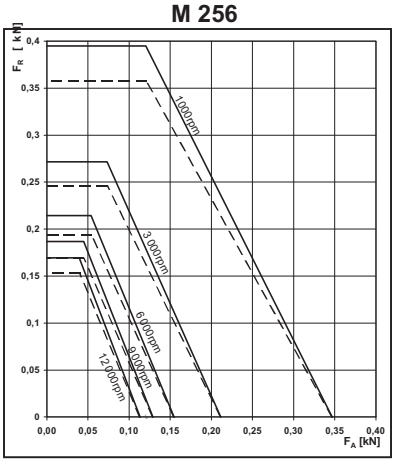


♦ Radiální a axiální zatížení volného konce ♦ Radial and axial shaft load capacity ♦ ♦ Zulässige Radial- und Axialbelastungen der Wellenenden ♦

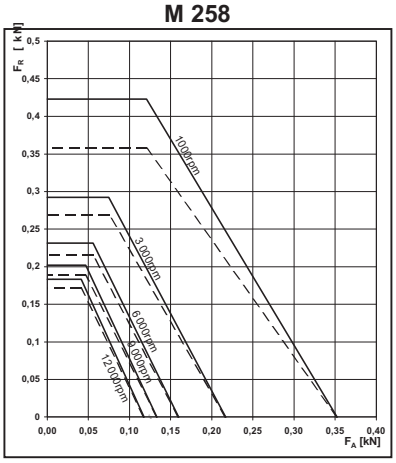
M 254



M 256

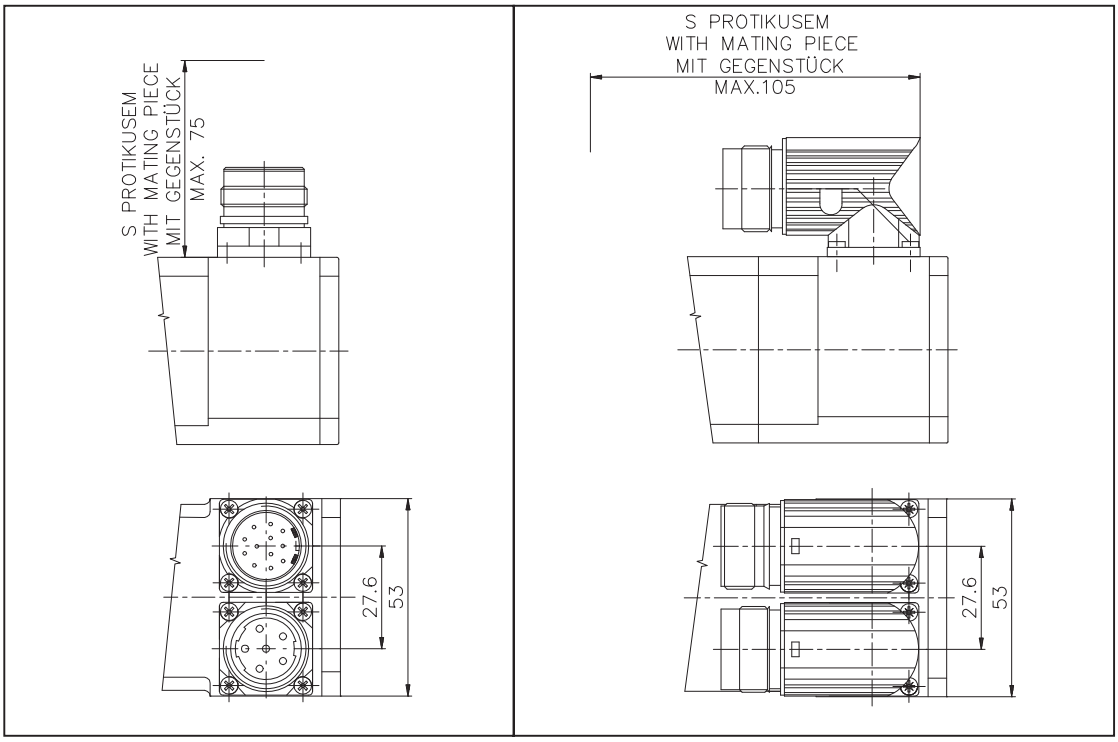


M 258

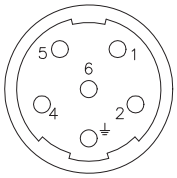


na konci hřídele / on the end of the shaft / auf welle ende
uprostřed hřídele / in the middle of the shaft / in mitte der welle

♦ Konektory ♦ Connectors ♦ Stecker ♦



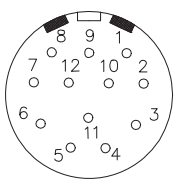
Motorový konektor
Power connector
Motorstecker



1 U
2 W
5 V
⏚ GND
4 Brzda / Brake / Bremse -
6 Brzda / Brake / Bremse +

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Signální konektor
Signal connector
Signalstecker



1 S1
2 S3
3 S4
4 S2
5 R1
6 R2
7,8 Teplotní spínač
Termoswitch
Termoschalter

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Speciální požadavky na provedení (vybavení) u všech servomotorů – po konzultaci s výrobcem.

Special requirements concerning the design (accessories) of all servomotors are settled by agreement with the producer.

Spezielle Anforderungen bezüglich der Ausführung (Ausrüstung) aller Servomotoren – Konsultation mit dem Hersteller ist erforderlich.

Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

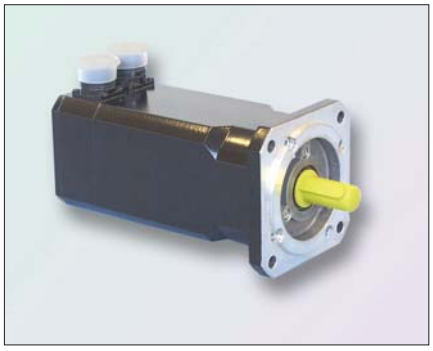
Technical data of servomotors

TYPE OF THE MOTOR				M254B	M254C	M254C	M254D	M254F	M254F	M256A	M256B	M256D	M256D	M256E
Voltage of intermediate circuit of converter		U_{DC}	V	120	120	330	330	330	560	120	120	330	560	330
S	STANDSTILL VALUES													
	Standstill torque	M_0	Nm	0,4	0,4	0,4	0,4	0,4	0,4	0,6	0,6	0,6	0,6	0,6
	Standstill current	I_0	A	2,9	1,6	1,6	1	0,55	0,55	2,90208	4,3	1,45	1,45	1,25
	Torque constant	k_M	Nm/A	0,140	0,248	0,248	0,413	0,728	0,728	0,207	0,140	0,410	0,410	0,496
N	RATED VALUES OF THE MOTOR													
	Rated voltage	$U_{N\ MOT}$	V	62	52	157	149	145	258	52	61	140	304	161
	Rated torque	M_N	Nm	0,35	0,38	0,32	0,36	0,38	0,36	0,57	0,53	0,55	0,47	0,55
	Rated current	I_N	A	2,69	1,58	1,47	0,93	0,53	0,52	2,86	4,12	1,42	1,35	1,18
	Rated speed	n_N	min^{-1}	6000	2000	9000	4500	2000	4500	3000	6000	4500	11000	4500
	Rated power output	P_N	W	220	80	302	169	80	170	178	333	259	541	259
	Voltage constant	K_E	Vmin/1000	8,5	15	15	25	45	45	12,5	8,5	25	25	30
	Voltage constant	k_e	Vs/rad	0,081	0,143	0,143	0,239	0,420	0,420	0,119	0,081	0,239	0,239	0,286
Ü	OVERLOADING CAPACITY AT RATED SPEED													
	Overloading capacity at rated speed	M_0	Nm	0,59	0,69	0,73	0,73	0,68	0,84	1,20	1	1,5	0,8	1,1
	Max. overloading capacity at rated speed	M_0/M_N	-	1,69	1,82	2,28	2,03	1,79	2,33	2,13	1,87	2,64	1,79	1,95
	VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1													
Max	MAX. VALUES OF THE MOTOR													
	Max. torque	M_{max}	Nm	2	2	2	2	2	2	2,6	2,6	2,6	2,6	2,6
	Max. current	I_{max}	A	14,5	7,7	7,7	4,8	2,7	2,7	13	7,2	7,2	7,2	6,1
	Max. speed	n_{mech}	min^{-1}	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000
C	LIMIT POINT													
	Current	I_C	A	14,5	4,8	7,7	4,3	1,7	2,7	12,5	7,2	7,2	7,2	6,1
	Breakdown torque	M_C	Nm	1,86	1,2	1,5	1,79	1,29	1,89	2,6	2,56	2,56	2,47	2,6
	Speed	n_C	min^{-1}	1420	0	4897	0	0	1124	0	2121	2121	6437	1870
Nutz	MAX. UTILIZABLE PARAMETERS FOR S1													
	Max. utilizable speed	n_{nutz}	min^{-1}	6911	3220	11235	6139	3001	6111	4415	6492	6492	12050	5451
	Max. utilizable torque	M_{nutz}	Nm	0,34	0,37	0,3	0,34	0,37	0	0,55	0,5	0,5	0,5	0,5
	Max. utilizable power output	P_{nutz}	W	244	125	350	221	117	220	254	356	356	580	306
O	NO-LOAD RUNNING (I and M = 0)													
	No-load speed	n_0	min^{-1}	8235	4667	12667	7600	4222	7333	5600	7600	7600	13200	6333
	TECHNICAL FEATURES													
	Number of poles	p	-	6	6	6	6	6	6	6	6	6	6	6
	Resistance of winding	R_{U-V}	Ω	3,24	11,1	11,1	30,84	84,60	84,60	3,6	1,77	14,91	14,91	17,30
	Inductance of winding	L_{U-V}	mH	1,86	5,7	5,7	17,51	46,70	46,70	4,7	1,23	10,71	10,71	13,46
	Moment of inertia	J	$kgm^2/1000$	0,009	0,009	0,009	0,009	0,009	0,009	0,012	0,012	0,012	0,012	0,012
	Mass	m	kg	1,1	1,1	1,1	1,1	1,1	1,1	1,2	1,3	1,3	1,3	1,3
	Axial load	F_A	N	65	88	88	77	88	88	75	65	90	90	90
	Radial load	F_R	N	240	302	302	274	302	302	270	250	312	312	312
	Average speed	n_{mitt}	min^{-1}	3000	1500	1500	2000	1500	1500	3000	3000	2000	2000	2000
	MECHANICAL VALUES OF THE MOTOR													
	Static friction torque	M_r	Nm	0,009	0,009	0,009	0,009	0,009	0,009	0,013	0,013	0,013	0,013	0,013
	Damping constant	k_D	$Nm.min.10^{-5}$	0,25	0,25	0,25	0,25	0,25	0,25	0,300	0,300	0,300	0,300	0,300
	Mechanical time constant	T_m	ms	2,26	2,5	2,5	2,42	4	4	1,46544	1,34	1,5	1,5	1,16
	THERMAL VALUES OF THE MOTOR													
	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W	1,55	1,62	1,26	1,52	1,87	1,74	1,42	1,19	1,30	0,91	1,53
	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W	1,25	1,31	1,02	1,23	1,52	1,41	1,15	0,96	1,05	0,73	1,24
	Thermal time constant	T_{th}	min	13,3	13,9	10,8	13,1	16,1	14,9	14,5	12,2	13,3	9,3	15,7
	COOLER													
	Quantity of water	Q_W	$dm^3.min^{-1}$	-	-	-	-	-	-	-	-	-	-	-
	Rated pressure of water	p_N	kPa	-	-	-	-	-	-	-	-	-	-	-
	Quantity of air	Q_L	$dm^3.s^{-1}$	-	-	-	-	-	-	-	-	-	-	-

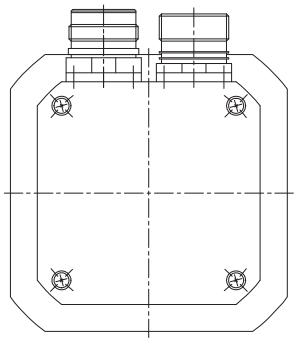
Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

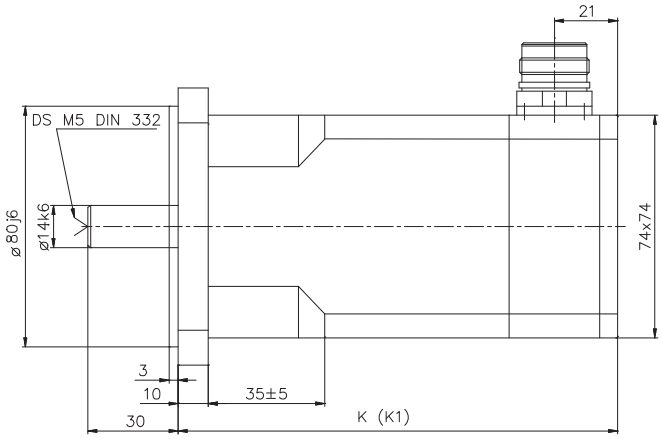
Technical data of servomotors

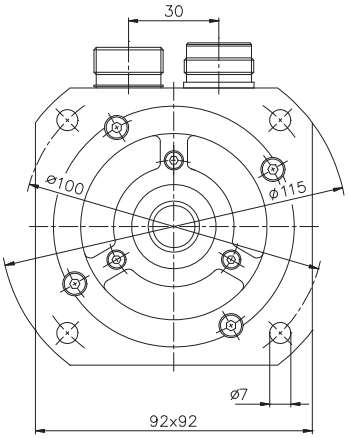
M256E	M256F	M256F	M258 B	M258 D	M258 D	M258 E	M258 E	M258 F	M258 F	TYPE OF THE MOTOR			
560	**330**	**560**	**120**	**120**	**330**	**330**	**560**	**330**	**560**	**Voltage of intermediate circuit of converter**		U_{DC}	V
										S	**STANDSTILL VALUES**		
0,6	0,6	0,6	0,9	0,9	0,9	0,9	0,9	0,9	0,9		Standstill torque	M_0	Nm
1,25	0,8	0,8	6,4	2,2	2,2	1,8138	1,8138	1,2092	1,2092		Standstill current	I_0	A
0,496	0,727	0,727	0,140	0,413	0,413	0,496	0,496	0,744	0,744		Torque constant	k_M	Nm/A
										N	**RATED VALUES OF THE MOTOR**		
297	132	246	57	55	168	157	263	167	302		Rated voltage	$U_{N\ MOT}$	V
0,50	0,58	0,55	0,77	0,87	0,77	0,80	0,73	0,84	0,8		Rated torque	M_N	Nm
1,15	0,80	0,79	6,01	2,15	2,04	1,73	1,66	1,17	1,13		Rated current	I_N	A
9000	2000	4500	6000	1500	6000	4500	8000	3000	6000		Rated speed	n_N	min^{-1}
471	122	259	485	136	485	379	611	263	485		Rated power output	P_N	W
30	45	45	8,5	25	25	30	30	45	45		Voltage constant	K_E	Vmin/1000
0,286	0,420	0,420	0,081	0,239	0,239	0,286	0,286	0,430	0,430		Voltage constant	k_e	Vs/rad
										Ü	**OVERLOADING CAPACITY AT RATED SPEED**		
1,0	1,3	1,5	2,0	2	1,5	1,8	2,2	1,4	1,3		Overloading capacity at rated speed	$M_Ü$	Nm
1,94	2,26	2,64	2,60	1,79	1,95	2,25	3,00	1,67	1,75		Max. overloading capacity at rated speed	$M_Ü/M_N$	-
VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1													
										Max	**MAX. VALUES OF THE MOTOR**		
2,6	2,6	2,6	3,6	3,6	3,6	3,6	3,6	3,6	3,6		Max. torque	M_{max}	Nm
6,1	4,1	4,1	31	10	10	8	8	5,3	5,3		Max. current	I_{max}	A
12000	12000	12000	9000	9000	9000	9000	9000	9000	9000		Max. speed	n_{mech}	min^{-1}
										C	**LIMIT POINT**		
6,1	3,3	4,1	31,0	8,1	10,0	8,0	8,0	5,3	5,3		Current	I_C	A
2,49	2,49	2,55	3,31	3,35	3,35	3,42	3,17	3,57	3,5		Breakdown torque	M_C	Nm
5624	0	2299	4366	0	3837	2774	6532	1056	3781		Speed	n_C	min^{-1}
										Nutz	**MAX. UTILIZABLE PARAMETERS FOR S1**		
10088	3269	6354	7555	2086	6877	5586	10241	3507	6613		Max. utilizable speed	n_{nutz}	min^{-1}
0,5	0,6	0,5	1	0,9	0,8	1	0,7	0,8	0,76		Max. utilizable torque	M_{nutz}	Nm
510	192	350	585	187	542	457	731	303	526		Max. utilizable power output	P_{nutz}	W
										O	**NO-LOAD RUNNING (I and M = 0)**		
11000	4222	7333	8235	2800	7600	6333	11000	4222	7333		No-load speed	n_0	min^{-1}
											TECHNICAL FEATURES		
6	6	6	6	6	6	6	6	6	6		Number of poles	p	-
17,30	42,90	42,9	0,73	6,75	6,75	9,80	9,80	21,80	21,80		Resistance of winding	R_{U-V}	Ω
13,46	31,80	31,8	0,64	5,6	5,6	9,50	9,50	18	18		Inductance of winding	L_{U-V}	mH
0,012	0,012	0,012	0,017	0,017	0,017	0,017	0,017	0,0165	0,0165		Moment of inertia	J	$kgm^2/1000$
1,3	1,3	1,3	1,8	1,8	1,8	1,8	1,8	1,55	1,55		Mass	m	kg
90	88	88	75	121	121	89	89	75	75		Axial load	F_A	N
312	318	318	265	395	395	307	307	270	270		Radial load	F_R	N
2000	1500	1500	3000	1000	1000	2000	2000	3000	3000		Average speed	n_{mitt}	min^{-1}
											MECHANICAL VALUES OF THE MOTOR		
0,013	0,013	0,0130	0,020	0,020	0,020	0,020	0,020	0,020	0,020		Static friction torque	M_r	Nm
0,300	0,300	0,3000	0,5	0,5	0,5	0,5	0,5	0,5	0,5		Damping constant	k_D	$Nm.min.10^{-5}$
1,16	1,34	1,34	0,92	0,98	0,98	0,99	0,99	0,97396	0,97396		Mechanical time constant	T_m	ms
											THERMAL VALUES OF THE MOTOR		
1,15	1,57	1,42	1,11	1,36	1,07	1,18	0,92	1,29	1,07		Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W
0,93	1,27	1,15	0,90	1,10	0,87	0,95	0,74	1,04	0,87		Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W
11,8	16,1	14,6	14,9	18,3	14,4	15,8	12,3	17,3	14,4		Thermal time constant	T_{th}	min
											COOLER		
-	-	-	-	-	-	-	-	-	-		Quantity of water	Q_W	$dm^3.min^{-1}$
-	-	-	-	-	-	-	-	-	-		Rated pressure of water	p_N	kPa
-	-	-	-	-	-	-	-	-	-		Quantity of air	Q_L	$dm^3.s^{-1}$



M 404
M 406
M 408







TYP SERVOMOTORU	MOTOR TYPE	MOTORTYP	M 404	M 406	M 408
K (bez brzdy)	**K** (without brake)	**K** (ohne bremse)	137	173	205
K1 (s brzdou)	**K1** (with brake)	**K1** (mit bremse)	169	205	232

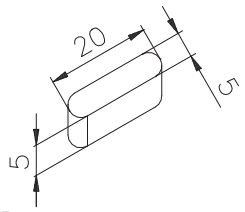
♦ Brzda ♦ Brake ♦ Bremse ♦

SERVOMOTOR	M_0 [Nm]	MAYR	M_B [Nm]	t_{1max} [ms]	t_{2max} [ms]	U_{1DC} [V]	n_{max} [min^{-1}]	J [$kg.m^2.10^{-3}$]	m [kg]
M 404 - B	1,2								
M 406 - B	2,3		2	50	30	24	9000	0,0245	0,62
M 408 - B	3								

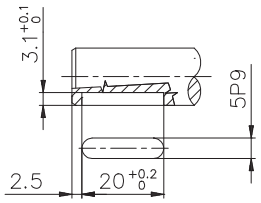
M_B - brzdný moment / holding torque / Haltemoment;
J - moment setrvačnosti / moment of inertia / Trägheitsmoment;
m - hmotnost / weight / Gewicht;
n_{MAX} - max. otáčky / max. speed / max. Drehzahl;

t_{1MAX} - max. čas sepnutí (odbrždění) / max. time of switching-on (brake release) / max. Einschaltzeit (lösung der Bremse);
t_{2MAX} - max.čas rozepnutí / max.time of switching-off / max.Ausschaltenzeit;
U_{1DC} - jmenovité napětí / rated voltage / Eingangsspannung;

♦ Hřídel ♦ Shaft ♦ Welle ♦



DIN 6885



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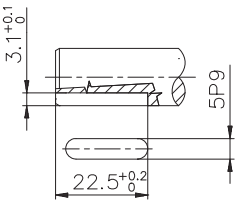
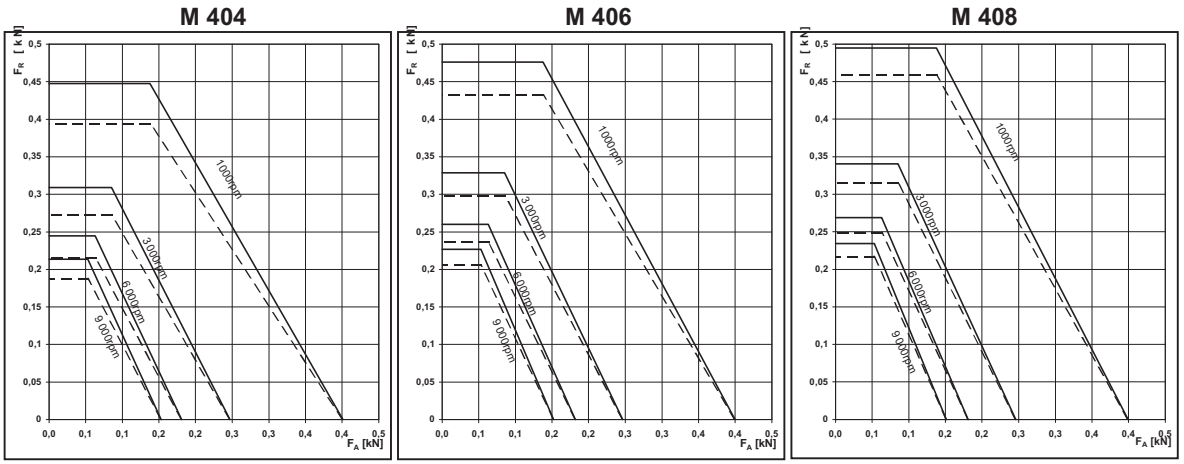
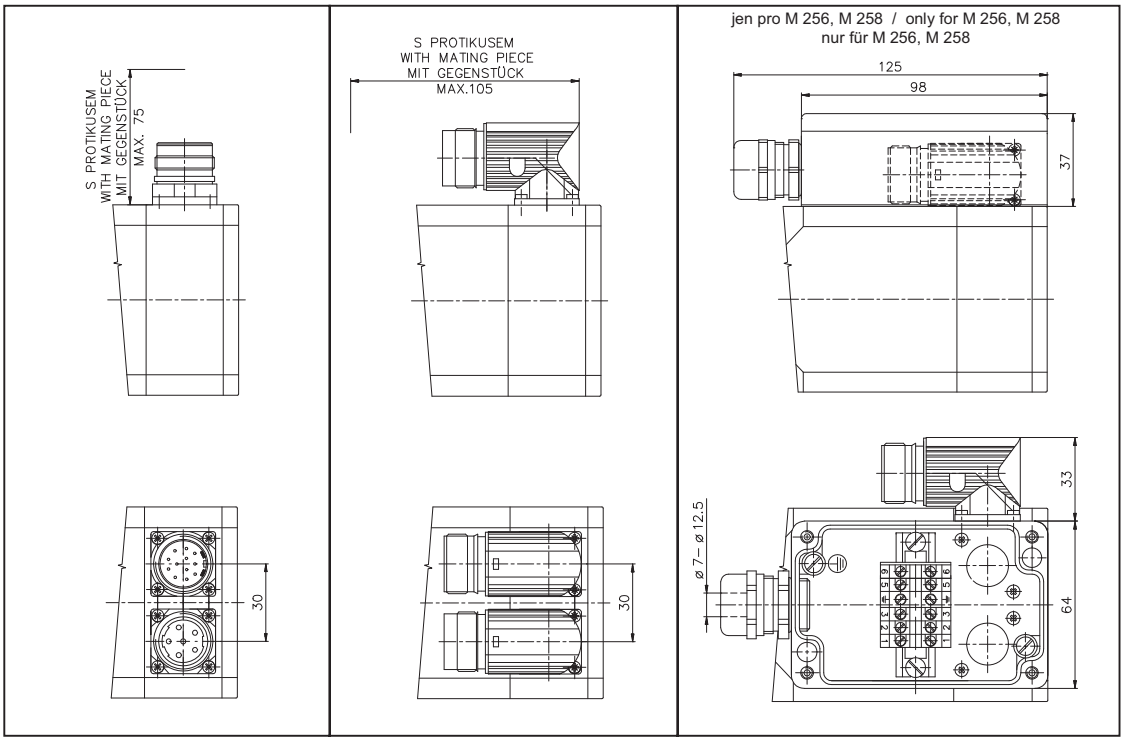


DIN 6885

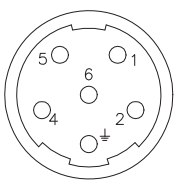
♦ Radiální a axiální zatížení volného konce ♦ Radial and axial shaft load capacity ♦ ♦ Zulässige Radial- und Axialbelastungen der Wellenenden ♦



♦ Konektory ♦ Connectors ♦ Stecker ♦



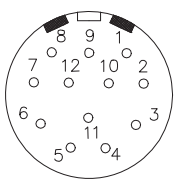
Motorový konektor / Power connector / Motorstecker



1 U
2 W
5 V
⏚ GND
4 Brzda / Brake / Bremse -
6 Brzda / Brake / Bremse +

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

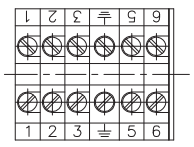
Signální konektor / Signal connector / Signalstecker



1 S1
2 S3
3 S4
4 S2
5 R1
6 R2
7,8 Teplotní spínač
Termoswitch
Termoschalter

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Svorkovnice / Terminal box / Klemme



1 U
2 V
3 W
⏚ GND
5 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse

Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

Technical data of servomotors

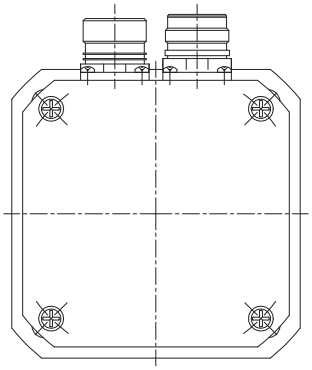
TYPE OF THE MOTOR				M404B	M404C	M404D	M404D	M404E	M404F	M404F	M404I	M406B	M406C	M406D	M406E	M406F
Voltage of intermediate circuit of converter		U_{DC}	V	120	120	120	330	330	330	560	560	120	120	330	330	330
S	STANDSTILL VALUES															
	Standstill torque	M_0	Nm	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	2,3	2,3	2,3	2,3	2,3
	Standstill current	I_0	A	8,5	4,8	2,9	2,9	2,42	1,65	1,65	0,8	16,4	9,3	5,6	4,64	3,2
	Torque constant	k_M	Nm/A	0,14	0,248	0,413	0,413	0,496	0,727	0,727	1,489	0,14	0,248	0,413	0,496	0,727
N	RATED VALUES OF THE MOTOR															
	Rated voltage	$U_{N\ MOT}$	V	64	53	52	165	151	158	290	230	62	50	159	146	148
	Rated torque	M_N	Nm	0,89	1,07	1,13	0,93	1,00	1,07	0,93	1,11	1,65	2,02	1,74	1,88	2,02
	Rated current	I_N	A	7,01	4,49	2,80	2,47	2,15	1,53	1,40	0,77	13,03	8,51	4,61	4,05	2,90
	Rated speed	n_N	min^{-1}	7000	3000	1500	6000	4500	3000	6000	2000	7000	3000	6000	4500	3000
	Rated power output	P_N	W	651	335	178	586	471	335	586	233	1209	635	1095	887	635
	Voltage constant	K_E	Vmin/1000	8,5	15	25	25	30	44	44	90	8,5	15	25	30	44
	Voltage constant	k_e	Vs/rad	0,081	0,143	0,239	0,239	0,286	0,420	0,420	0,859	0,081	0,143	0,239	0,286	0,420
Ü	OVERLOADING CAPACITY AT RATED SPEED															
	Overloading capacity at rated speed	M_0	Nm	1,48	3,04	2,42	1,84	2,48	2,34	1,88	3	3,7	8,1	5,4	6,7	6,1
	Max. overloading capacity at rated speed	M_0/M_N	-	1,66	2,84	2,14	1,98	2,48	2,19	2,02	2,7	2,23	4	3,08	3,59	3,02
	VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1															
Max	MAX. VALUES OF THE MOTOR															
	Max. torque	M_{max}	Nm	5,3	5,3	5,3	5,3	5,3	5,3	5,3	5,3	10,1	10,1	10,1	10,1	10,1
	Max. current	I_{max}	A	40	19	14,4	14,4	12	7	7	4	100	40	27	23	15,6
	Max. speed	n_{mech}	min^{-1}	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000
C	LIMIT POINT															
	Current	I_C	A	40	19	12,6	14,4	12	7	7	4	100	40	27	23	15,6
	Breakdown torque	M_C	Nm	3,88	4,60	5,21	4,14	4,35	4,77	3,99	5,03	9,71	9,87	9,70	9,78	9,91
	Speed	n_C	min^{-1}	4361	2149	0	3553	2920	1629	4028	843	4454	2619	4552	3601	2119
Nutz	MAX. UTILIZABLE PARAMETERS FOR S1															
	Max. utilizable speed	n_{nutz}	min^{-1}	7689	4109	2208	7007	5800	3736	6923	3109	7894	4302	7241	5976	3961
	Max. utilizable torque	M_{nutz}	Nm	0,86	1,02	1,10	0,89	0,94	1,03	0,89	1,06	1,57	1,90	1,63	1,74	1,93
	Max. utilizable power output	P_{nutz}	W	690	437	255	651	572	404	646	345	1294	856	1233	1092	801
O	NO-LOAD RUNNING (I and M = 0)															
	No-load speed	n_0	min^{-1}	8235	4667	2800	7600	6333	4318	7500	3667	8235	4667	7600	6333	4318
	TECHNICAL FEATURES															
	Number of poles	p	-	6	6	6	6	6	6	6	6	6	6	6	6	6
	Resistance of winding	R_{U-V}	Ω	0,44	1,364	4,14	4,14	5,23	12,44	12,44	50,42	0,15	0,47	1,30	1,83	3,87
	Inductance of winding	L_{U-V}	mH	0,7	2,282	6,28	6,28	8,79	19,23	19,23	76,24	0,3	1	2,80	4	8,84
	Moment of inertia	J	$kgm^2/1000$	0,072	0,072	0,072	0,072	0,072	0,072	0,072	0,072	0,127	0,127	0,127	0,127	0,127
	Mass	m	kg	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,4	3,6	3,6	3,6	3,6	3,6
	Axial load	F_A	N	75	114	138	138	102	114	114	114	74	114	85	100	114
	Radial load	F_R	N	280	368	447	447	354	368	368	368	290	404	320	367	404
	Average speed	n_{mitt}	min^{-1}	4000	1500	1000	1000	2000	1500	1500	1500	4000	1500	3000	2000	1500
	MECHANICAL VALUES OF THE MOTOR															
	Static friction torque	M_r	Nm	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,04	0,04	0,04	0,04	0,04
	Damping constant	k_D	$Nm.min.10^{-5}$	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,9	0,9	0,9	0,9	0,9
	Mechanical time constant	T_m	ms	2,46	2,3	2	2	2,25	2,5	2,5	2,4	1,37	1,38	1,37	1,34	1,32
	THERMAL VALUES OF THE MOTOR															
	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W	0,95	1,31	1,30	1,00	1,21	1,25	1,02	1,34	0,77	1,06	0,84	0,97	1,08
	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W	0,77	1,06	1,05	0,81	0,98	1,01	0,82	1,09	0,62	0,86	0,68	0,78	0,88
	Thermal time constant	T_{th}	min	18,9	25,9	25,7	19,9	24,1	24,9	20,2	26,6	21,5	29,5	23,5	27,0	30,2
	COOLER															
	Quantity of water	Q_W	$dm^3.min^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rated pressure of water	p_N	kPa	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quantity of air	Q_L	$dm^3.s^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-

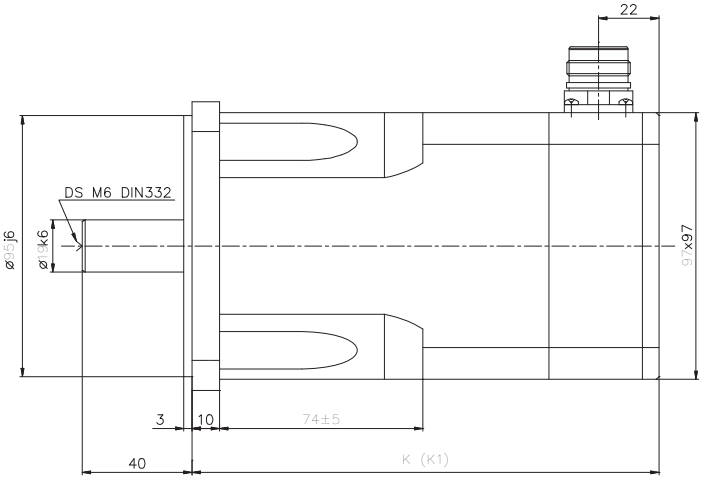
Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

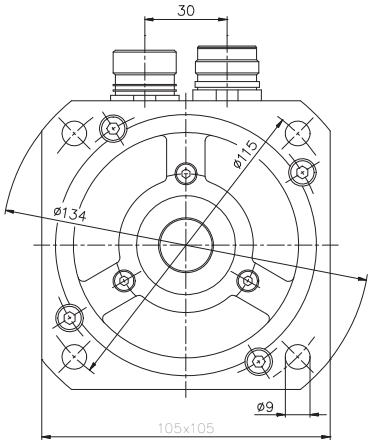
Technical data of servomotors

M406F	M406G	M406G	M406H	M406I	M406K	M408 D	M408 D	M408 E	M408 E	M408 F	M408 F	M408 I	TYPE OF THE MOTOR		
560	**330**	**560**	**560**	**560**	**560**	**120**	**330**	**120**	**330**	**330**	**560**	**560**	**Voltage of intermediate circuit of converter**	U_{DC}	V
													S **STANDSTILL VALUES**		
2,3	2,3	2,3	2,3	2,3	2,3	3	3	3	3	3	3	3	Standstill torque	M_0	Nm
3,2	2,8	2,8	2,3	1,55	1,99	7,3	7,3	6,1	6,1	4,2	4,2	2,015	Standstill current	I_0	A
0,727	0,827	0,827	0,992	1,488	1,158	0,413	0,413	0,496	0,496	0,727	0,727	1,489	Torque constant	k_M	Nm/A
													N **RATED VALUES OF THE MOTOR**		
280	169	244	292	301	233	57	181	53	143	145	276	294	Rated voltage	$U_{N\ MOT}$	V
1,74	2,02	1,88	1,88	2,02	2,02	2,68	1,89	2,76	2,28	2,52	2,04	2,52	Rated torque	M_N	Nm
2,62	2,55	2,43	2,03	1,42	1,82	6,68	5,07	5,69	4,92	3,62	3,07	1,77	Rated current	I_N	A
6000	3000	4500	4500	3000	3000	2000	7000	1500	4500	3000	6000	3000	Rated speed	n_N	min^{-1}
1095	635	887	887	635	635	562	1382	434	1076	792	1285	792	Rated power output	P_N	W
44	50	50	60	90	70	25	25	30	30	44	44	90	Voltage constant	K_E	Vmin/1000
0,420	0,477	0,477	0,573	0,859	0,668	0,239	0,239	0,286	0,286	0,420	0,420	0,890	Voltage constant	k_e	Vs/rad
													Ü **OVERLOADING CAPACITY AT RATED SPEED**		
5,1	3,8	7	4,1	3,5	7,9	6,7	3,3	7,4	9,4	8,2	6,4	5,2	Overloading capacity at rated speed	$M_Ü$	Nm
2,93	1,89	3,7	2,2	1,73	3,9	2,5	1,73	2,7	4,14	3,24	3,12	2,06	Max. overloading capacity at rated speed	$M_Ü/M_N$	-
VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1															
													Max **MAX. VALUES OF THE MOTOR**		
10,1	10,1	10,1	10,1	10,1	10,1	12,9	12,9	12,9	12,9	12,9	12,9	12,9	Max. torque	M_{max}	Nm
15,6	13,8	13,8	11,5	7,7	9,7	35	35	29	29	20	20	9,7	Max. current	I_{max}	A
9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	Max. speed	n_{mech}	min^{-1}
													C **LIMIT POINT**		
15,6	13,8	13,8	11,5	7,7	9,7	35	35	29	29	20	20	9,6	Current	I_C	A
9,71	9,96	9,78	9,84	9,96	9,88	12,45	11,10	12,58	11,45	12,08	11,23	12,19	Breakdown torque	M_C	Nm
4436	1604	3605	2934	1644	2539	1261	5033	897	4067	2309	4670	1980	Speed	n_C	min^{-1}
													Nutz **MAX. UTILIZABLE PARAMETERS FOR S1**		
7148	3414	6212	5131	3317	4387	2524	7363	2059	6083	4023	7236	3399	Max. utilizable speed	n_{nutz}	min^{-1}
1,64	1,98	1,72	1,82	1,99	1,89	2,60	1,83	2,67	2,03	2,36	1,85	2,46	Max. utilizable torque	M_{nutz}	Nm
1224	709	1120	979	692	869	687	1409	576	1294	994	1400	875	Max. utilizable power output	P_{nutz}	W
													O **NO-LOAD RUNNING (I and M = 0)**		
7500	3800	6600	5500	3667	4714	2800	7600	2333	6333	4318	7500	3667	No-load speed	n_0	min^{-1}
													TECHNICAL FEATURES		
6	6	6	6	6	6	6	6	6	6	6	6	6	Number of poles	p	-
3,874	5,4	5,4	7,46	15,93	8,75	0,79	0,791	1,13	1,13	2,61	2,61	9,84	Resistance of winding	R_{U-V}	Ω
8,836	12,1	12,1	16,5	36,52	22,48	1,87	1,87	2,7	2,7	6,54	6,54	25,6	Inductance of winding	L_{U-V}	mH
0,127	0,127	0,127	0,127	0,127	0,127	0,16	0,16	0,16	0,16	0,16	0,16	0,16	Moment of inertia	J	$kgm^2/1000$
3,6	3,6	3,6	3,6	3,6	3,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	Mass	m	kg
114	114	114	100	114	114	114	114	138	138	114	114	114	Axial load	F_A	N
404	404	404	367	404	404	404	404	487	487	404	404	404	Radial load	F_R	N
1500	1500	1500	2000	1500	1500	1500	1500	1000	1000	1500	1500	1500	Average speed	n_{mitt}	min^{-1}
													MECHANICAL VALUES OF THE MOTOR		
0,04	0,04	0,04	0,040	0,040	0,040	0,05	0,05	0,05	0,05	0,05	0,05	0,05	Static friction torque	M_r	Nm
0,9	0,9	0,9	0,9	0,9	0,9	1,8	1,8	1,8	1,8	1,8	1,8	1,8	Damping constant	k_D	$Nm.min.10^{-5}$
1,32	1,42	1,42	1,36	1,3	1,18	1,11	1,11	1,1	1,1	1,18	1,18	1,03	Mechanical time constant	T_m	ms
													THERMAL VALUES OF THE MOTOR		
0,86	1,02	0,93	0,96	1,10	1,17	0,99	0,56	1,02	0,79	0,88	0,63	0,94	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W
0,69	0,83	0,76	0,77	0,89	0,95	0,80	0,46	0,83	0,64	0,71	0,51	0,76	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W
23,9	28,6	26,1	26,7	30,6	32,7	33,7	19,3	34,8	26,9	30,2	21,7	32,0	Thermal time constant	T_{th}	min
													COOLER		
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of water	Q_W	$dm^3.min^{-1}$
-	-	-	-	-	-	-	-	-	-	-	-	-	Rated pressure of water	p_N	kPa
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of air	Q_L	$dm^3.s^{-1}$

M 504
M 506
M 508







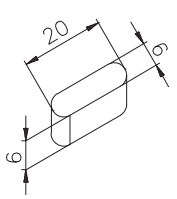
TYP SERVOMOTORU	MOTOR TYPE	MOTORTYP	M 504	M 506	M 508
K (bez brzdy)	**K** (without brake)	**K** (ohne bremse)	200	245	290
K1 (s brzdou)	**K1** (with brake)	**K1** (mit bremse)	231	276	321

♦ Brzda ♦ Brake ♦ Bremse ♦

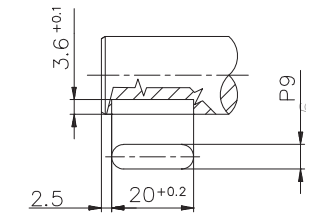
SERVOMOTOR	M_0 [Nm]	MAYR	M_B [Nm]	t_{1max} [ms]	t_{2max} [ms]	U_{1DC} [V]	n_{max} [min^{-1}]	J [$kg.m^2.10^{-3}$]	m [kg]
M 504 - B	4,6								
M 506 - B	6,9		6	65	60	24	7500	0,1038	1,12
M 508 - B	9,1								

M_B - brzdný moment / holding torque / Haltemoment;
J - moment setrvačnosti / moment of inertia / Trägheitsmoment;
m - hmotnost / weight / Gewicht;
n_{MAX} - max. otáčky / max. speed / max. Drehzahl;
t_{1MAX} - max. čas sepnutí (odbrždění) / max. time of switching-on (brake release) / max. Einschaltzeit (lösung der Bremse);
t_{2MAX} - max.čas rozepnutí / max.time of switching-off / max.Ausschaltenzeit;
U_{1DC} - jmenovité napětí / rated voltage / Eingangsspannung;

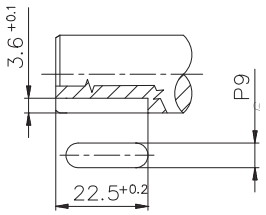
♦ Hřídel ♦ Shaft ♦ Welle ♦



DIN 6885



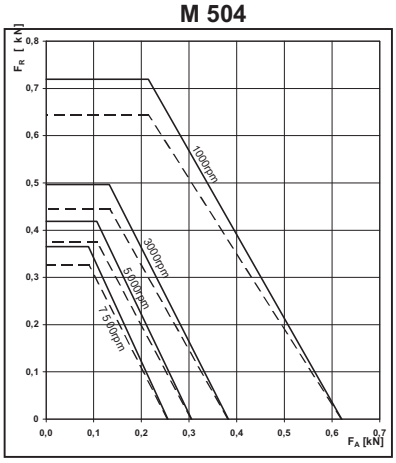
DIN 6885



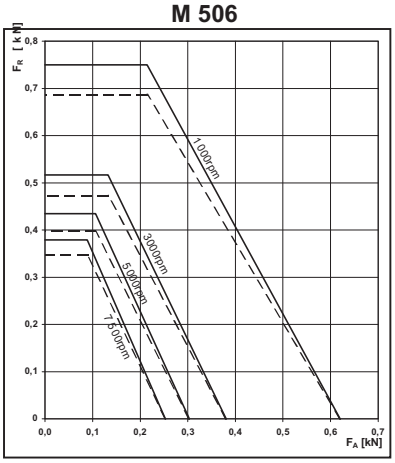
DIN 6885

♦ Radiální a axiální zatížení volného konce ♦ Radial and axial shaft load capacity ♦ ♦ Zulässige Radial- und Axialbelastungen der Wellenenden ♦

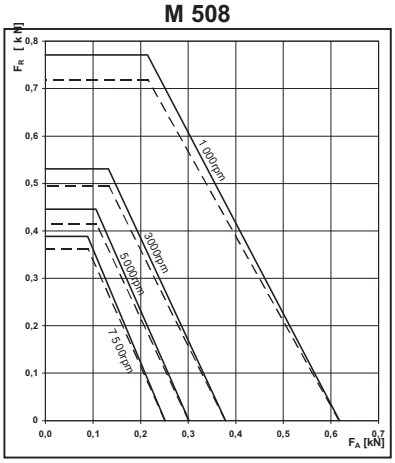
M 504



M 506

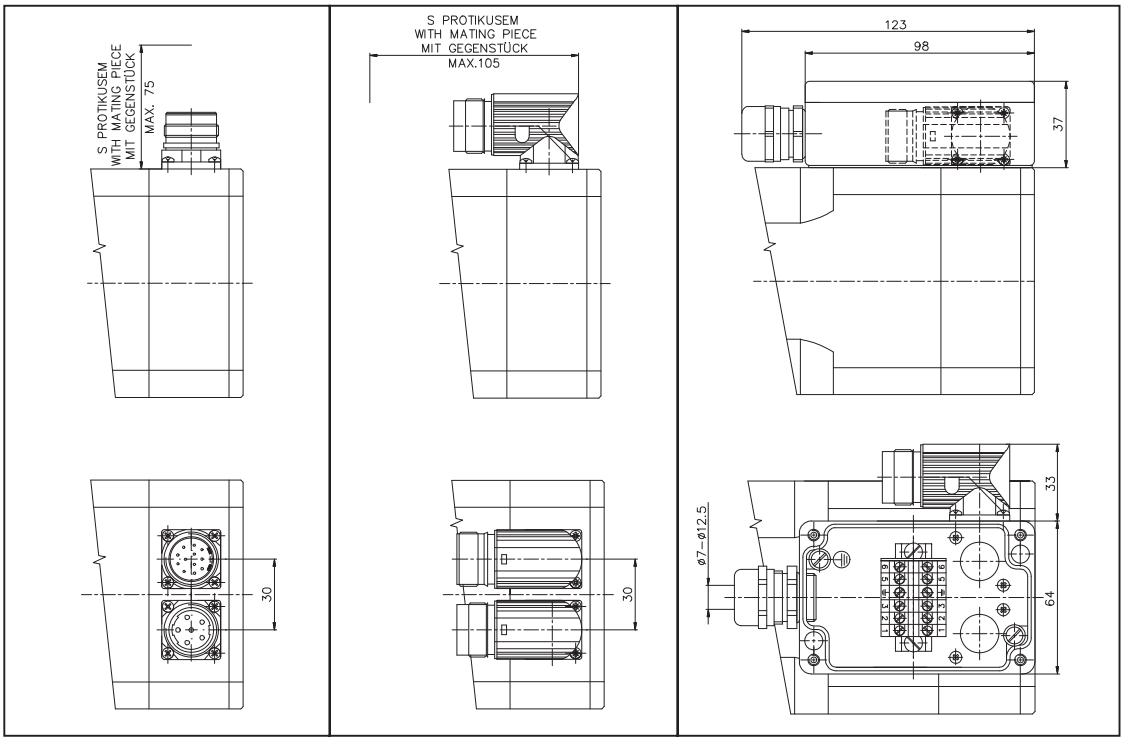


M 508

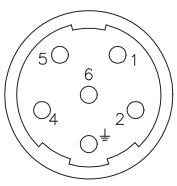


na konci hřídele / on the end of the shaft / auf welle ende
uprostřed hřídele / in the middle of the shaft / in mitte der welle

♦ Konektory ♦ Connectors ♦ Stecker ♦



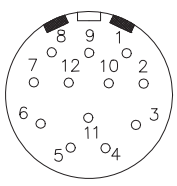
Motorový konektor / Power connector / Motorstecker



1 U
2 W
5 V
⏚ GND
4 Brzda / Brake / Bremse -
6 Brzda / Brake / Bremse +

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

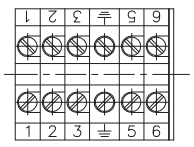
Signální konektor / Signal connector / Signalstecker



1 S1
2 S3
3 S4
4 S2
5 R1
6 R2
7,8 Teplotní spínač / Termoswitch / Termoschalter

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Svorkovnice / Terminal box / Klemme



1 U
2 V
3 W
⏚ GND
5 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse

Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

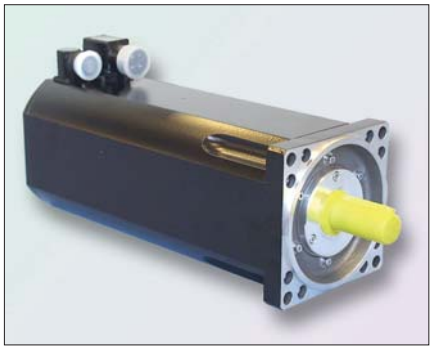
Technical data of servomotors

TYPE OF THE MOTOR				M504D	M504E	M504F	M504F	M504G	M504G	M504H	M504I	M504K	M506F	M506F	M506G	M506G	M506H
Voltage of intermediate circuit of converter		U_{DC}	V	330	330	330	560	330	560	560	560	560	330	560	330	560	330
S	STANDSTILL VALUES																
	Standstill torque	M_0	Nm	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	4,6	6,9	6,9	6,9	6,9	6,9
	Standstill current	I_0	A	11,1	9,3	6,3	6,3	5,6	6,3	4,45	3,1	4	9,5	9,5	8,343	8,343	7
	Torque constant	k_M	Nm/A	0,41	0,497	0,728	0,728	0,827	0,728	0,992	1,488	1,158	0,728	0,728	0,827	0,827	0,992
N	RATED VALUES OF THE MOTOR																
	Rated voltage	$U_{N\ MOT}$	V	160	145	147	281	166	242	293	298	226	143	275	161	310	132
	Rated torque	M_N	Nm	3,26	3,60	3,93	3,26	4	3,60	3,60	3,93	3,9	5	4,1	5,5	4,1	6,0
	Rated current	I_N	A	9	7,75	5,6	4,90	4,97	4,65	3,9	2,76	4	7,9	6,13	6,94	5,40	6,18
	Rated speed	n_N	min^{-1}	6000	4500	3000	6000	3000	4500	4500	3000	3000	3000	6000	3000	6000	2000
	Rated power output	P_N	W	2050	1695	1235	2050	1235	1695	1695	1235	1235	1725	2564	1725	2564	1248
	Voltage constant	K_E	Vmin/1000	25	30	44	44	50	50	60	90	70	44	44	50	50	60
	Voltage constant	k_e	Vs/rad	0,239	0,287	0,42	0,42	0,477	0,477	0,573	0,859	0,668	0,42	0,42	0,477	0,477	0,573
Ü	OVERLOADING CAPACITY AT RATED SPEED																
	Overloading capacity at rated speed	M_0	Nm	7,86	10,73	10,62	7,57	7,81	11,87	6,99	7	17,2	17,6	12,5	15,2	8,0	20,5
	Max. overloading capacity at rated speed	M_0/M_N	-	2,41	2,98	2,7	2,32	1,99	3,3	1,94	1,75	4,39	3,21	3,07	2,768	1,959	3,45
	VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1																
Max	MAX. VALUES OF THE MOTOR																
	Max. torque	M_{max}	Nm	20,2	20,2	20,2	20,2	20,2	20,2	20,2	20,2	20,2	30,3	30,3	30,3	30,3	30,3
	Max. current	I_{max}	A	54	45	31,5	31,5	27,5	27,5	22,5	15	20	47	47	34	34	37
	Max. speed	n_{mech}	min^{-1}	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500
C	LIMIT POINT																
	Current	I_C	A	54	45	31,5	31,5	27,5	27,5	22,5	15	20	47	47	34	34	37
	Breakdown torque	M_C	Nm	17,83	18,2	19,0	17,87	19,09	18,01	19	19,13	18,26	29,01	27,9	28,8	27,6	29,39
	Speed	n_C	min^{-1}	3530	3028	1836	3468	1663	3259	2493	1596	2888	2043	3808	2200	4063	1439
Nutz	MAX. UTILIZABLE PARAMETERS FOR S1																
	Max. utilizable speed	n_{nutz}	min^{-1}	7205	5976	3964	7120	3472	6252	5115	3346	4492	4063	7285	3585	6405	2951
	Max. utilizable torque	M_{nutz}	Nm	2,99	3,27	3,7	3,01	3,83	3	3,46	3,9	3,6	5,0	3,5	5,2	3,9	5,5
	Max. utilizable power output	P_{nutz}	W	2259	2045	1543	2246	1391	2099	1853	1351	1693	2123	2653	1958	2610	1704
O	NO-LOAD RUNNING (I and M = 0)																
	No-load speed	n_0	min^{-1}	7600	6333	4318	7500	3800	6600	5500	3667	4714	4318	7500	3800	6600	3167
	TECHNICAL FEATURES																
	Number of poles	p	-	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Resistance of winding	R_{U-V}	Ω	0,44	0,59	1,31	1,31	1,84	1,84	2,752	5,257	3,034	0,74	0,74	0,81	0,81	1,19
	Inductance of winding	L_{U-V}	mH	2,5	3,384	7,59	7,59	8,60	8,60	13,72	30,24	10	5	5	5	5	7,7
	Moment of inertia	J	$kgm^2/1000$	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,435	0,435	0,414	0,414	0,435
	Mass	m	kg	6,4	6,4	6,4	6,4	6,4	6,4	6,4	6,4	6,4	8,2	8,2	8,1	8,1	8,2
	Axial load	F_A	N	140	158	190	190	190	190	158	190	190	190	190	133	133	231
	Radial load	F_R	N	550	569	638	638	638	638	569	638	638	703	703	473	473	805
	Average speed	n_{mitt}	min^{-1}	3000	2000	1500	1500	1500	1500	2000	1500	1500	1500	1500	3000	3000	1000
	MECHANICAL VALUES OF THE MOTOR																
	Static friction torque	M_r	Nm	0,056	0,056	0,056	0,056	0,056	0,056	0,056	0,056	0,056	0,09	0,09	0,09	0,09	0,09
	Damping constant	k_D	$Nm.min.10^{-5}$	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	4	4	4	4	4
	Mechanical time constant	T_m	ms	1,12	1,04	1,08	1,08	1,17	1,17	1,22	1,03	1	0,94	0,94	0,739	0,739	0,82
	THERMAL VALUES OF THE MOTOR																
	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W	0,50	0,64	0,75	0,51	0,71	0,60	0,59	0,77	0,79	0,58	0,37	0,63	0,38	0,71
	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W	0,41	0,51	0,61	0,41	0,58	0,49	0,48	0,62	0,64	0,47	0,30	0,51	0,31	0,57
	Thermal time constant	T_{th}	min	26,7	33,9	40,0	27,0	37,9	32,1	31,6	41,0	42,2	42,3	26,8	45,9	27,6	51,2
	COOLER																
	Quantity of water	Q_W	$dm^3.min^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rated pressure of water	p_N	kPa	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quantity of air	Q_L	$dm^3.s^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-

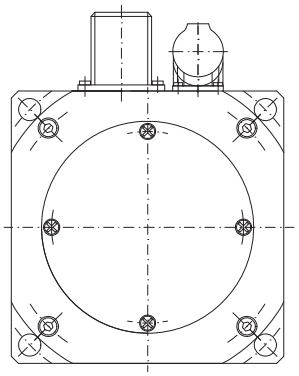
Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

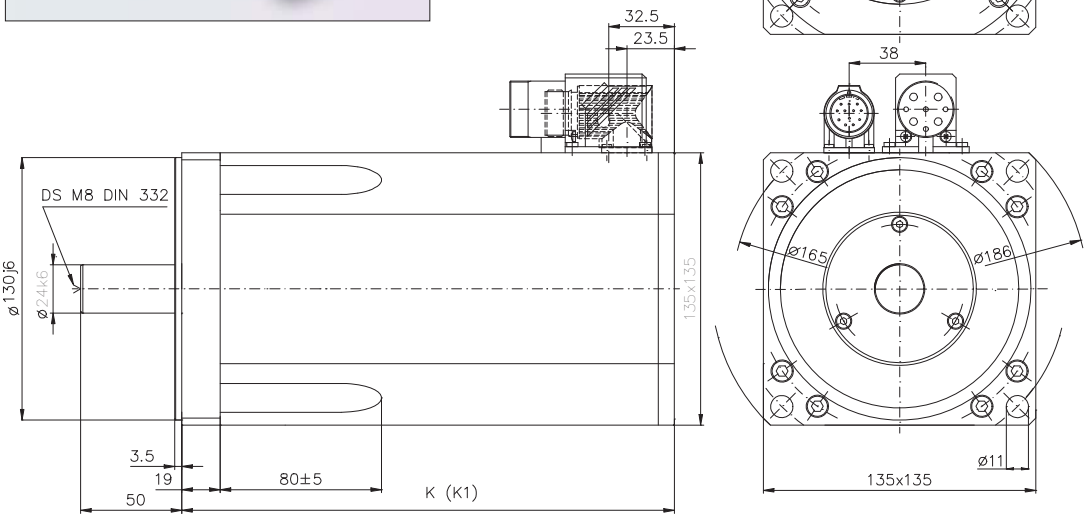
Technical data of servomotors

M506H	M506I	M506K	M506L	M506N	M508 E	M508 F	M508 F	M508 G	M508 G	M508 H	M508 K	M508 L	TYPE OF THE MOTOR		
560	560	560	560	560	330	330	560	330	560	560	560	560	Voltage of intermediate circuit of converter	U_{DC}	V
													S STANDSTILL VALUES		
6,9	6,9	6,9	6,9	6,9	9,1	9,1	9,1	9,1	9,1	9,1	9,1	9,1	Standstill torque	M_0	Nm
7	4,635	6	3,5	2,8	18,3	12,5	12,5	11	11	9,2	7,86	4,585	Standstill current	I_0	A
0,992	1,488	1,158	1,985	2,48	0,497	0,728	0,728	0,827	0,827	0,992	1,158	1,985	Torque constant	k_M	Nm/A
													N RATED VALUES OF THE MOTOR		
283	291	226	267	255	184	140	313	159	307	280	225	259	Rated voltage	$U_{N\,MOT}$	V
5	5,5	5	6,0	6,2	4	6,7	3,6	6,7	4,4	5,5	6,5	8	Rated torque	M_N	Nm
5,2	3,85	4,95	3,09	2,55	9,61	9,66	5,45	8,50	5,77	5,97	5,87	3,90	Rated current	I_N	A
4500	3000	3000	2000	1500	6000	3000	7000	3000	6000	4500	3000	2000	Rated speed	n_N	min^{-1}
2255	1725	1725	1248	973	2740	2114	2618	2114	2740	2613	2042	1575	Rated power output	P_N	W
60	90	70	120	150	30	44	44	50	50	60	70	120	Voltage constant	K_E	Vmin/1000
0,573	0,86	0,668	1,146	1,432	0,287	0,42	0,42	0,477	0,477	0,573	0,668	1,146	Voltage constant	k_e	Vs/rad
													Ü OVERLOADING CAPACITY AT RATED SPEED		
11,9	11,4	21,5	15	16,7	8,0	30,9	8,4	24,1	12,2	17,9	33,3	26,4	Overloading capacity at rated speed	$M_Ü$	Nm
2,49	2,07	3,91	2,51	2,69	1,83	4,59	2,36	3,587	2,809	3,22	5,12	3,508	Max. overloading capacity at rated speed	$M_Ü/M_N$	-
VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1															
													Max MAX. VALUES OF THE MOTOR		
30,3	30,3	30,3	30,3	30,3	40	40	40	40	40	40	40	40	Max. torque	M_{max}	Nm
37	23	30	17,5	14	68	47	47	38	38	39	34	20	Max. current	I_{max}	A
7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	Max. speed	n_{mech}	min^{-1}
													C LIMIT POINT		
37	23	30	17,5	14	68	47	47	38	38	39	34	20	Current	I_C	A
28,56	29,20	28,82	29,55	29,73	37,04	38,19	36,7	38,3	37,0	37,8	38,15	38,93	Breakdown torque	M_C	Nm
2759	1741	2346	1183	906	4361	2669	4859	2505	4584	3213	2728	1616	Speed	n_C	min^{-1}
													Nutz MAX. UTILIZABLE PARAMETERS FOR S1		
5288	3428	4481	2516	1989	6214	4137	7390	3624	6473	5340	4546	2592	Max. utilizable speed	n_{nutz}	min^{-1}
4,4	5,3	5	5,7	6,0	4,2	5,8	3,26	6,24	3,99	4,88	5,51	7,05	Max. utilizable torque	M_{nutz}	Nm
2445	1899	2250	1507	1243	2728	2527	2525	2367	2703	2730	2623	1914	Max. utilizable power output	P_{nutz}	W
													O NO-LOAD RUNNING (I and M = 0)		
5500	3667	4714	2750	2200	6333	4318	7500	3800	6600	5500	4714	2750	No-load speed	n_0	min^{-1}
													TECHNICAL FEATURES		
6	6	6	6	6	6	6	6	6	6	6	6	6	Number of poles	p	-
1,19	2,947	1,767	5,24	7,5	0,19	0,46	0,46	0,59	0,59	0,81	1,09	3,2	Resistance of winding	R_{U-V}	Ω
7,7	18,12	10,77	32,61	50	1,30	3,157	3,157	3,8	3,8	5,985	7,92	18,5	Inductance of winding	L_{U-V}	mH
0,435	0,435	0,435	0,435	0,435	0,61	0,61	0,61	0,591	0,591	0,61	0,61	0,591	Moment of inertia	J	$kgm^2/1000$
8,2	8,2	8,2	8,2	8,2	10,2	10,2	10,2	10,3	10,3	10,2	10,2	10,3	Mass	m	kg
231	190	190	231	231	140	180	180	133	133	158	180	158	Axial load	F_A	N
805	703	703	805	805	530	675	675	494	494	612	675	567	Radial load	F_R	N
1000	1500	1500	1000	1000	3000	1500	1500	3000	3000	2000	1500	2000	Average speed	n_{mitt}	min^{-1}
													MECHANICAL VALUES OF THE MOTOR		
0,09	0,09	0,09	0,09	0,09	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	Static friction torque	M_r	Nm
4	4	4	4	4	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	Damping constant	k_D	$Nm.min.10^{-5}$
0,82	0,9	0,89	0,9	0,82	0,7	0,8	0,8	0,762	0,762	0,75	0,74	0,72	Mechanical time constant	T_m	ms
													THERMAL VALUES OF THE MOTOR		
0,50	0,60	0,60	0,66	0,73	0,32	0,53	0,26	0,53	0,32	0,42	0,56	0,61	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W
0,40	0,49	0,49	0,54	0,59	0,26	0,43	0,21	0,43	0,26	0,34	0,45	0,50	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W
36,0	43,3	43,5	48,1	53,0	25,5	42,0	20,8	42,2	25,1	33,6	44,5	48,6	Thermal time constant	T_{th}	min
													COOLER		
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of water	Q_W	$dm^3.min^{-1}$
-	-	-	-	-	-	-	-	-	-	-	-	-	Rated pressure of water	p_N	kPa
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of air	Q_L	$dm^3.s^{-1}$



M 713
M 714
M 716
M 718





TYP SERVOMOTORU	MOTOR TYPE	MOTORTYP	M 713	M 714	M716	M 718
K (bez brzdy)	**K** (without brake)	**K** (ohne bremse)	244	294	344	394
K1 (s brzdou)	**K1** (with brake)	**K1** (mit bremse)	293	343	393	-

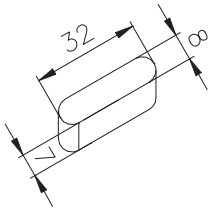
♦ Brzda ♦ Brake ♦ Bremse ♦

SERVOMOTOR	M_0 [Nm]		M_B [Nm]	t_{1max} [ms]	t_{2max} [ms]	U_{1DC} [V]	n_{max} [min^{-1}]	J [$kg.m^2.10^{-3}$]	m [kg]
M 713 - B	10	**MAYR**	20	80	80	24	6000	0,4838	2,74
M 714 - B	16								
M 716 - B	21								
M 718 - B	27								

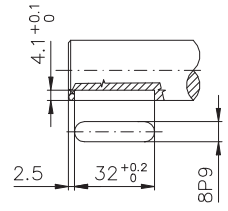
M_B - brzdný moment / holding torque / Haltemoment;
J - moment setrvačnosti / moment of inertia / Trägheitsmoment;
m - hmotnost / weight / Gewicht;
n_{MAX} - max. otáčky / max. speed / max. Drehzahl;

t_{1MAX} - max. čas sepnutí (odbrždění) / max. time of switching-on (brake release) / max. Einschaltzeit (lösung der Bremse);
t_{2MAX} - max.čas rozepnutí / max.time of switching-off / max.Ausschaltenzeit;
U_{1DC} - jmenovité napětí / rated voltage / Eingangsspannung;

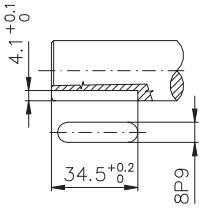
♦ Hřídel ♦ Shaft ♦ Welle ♦



DIN 6885



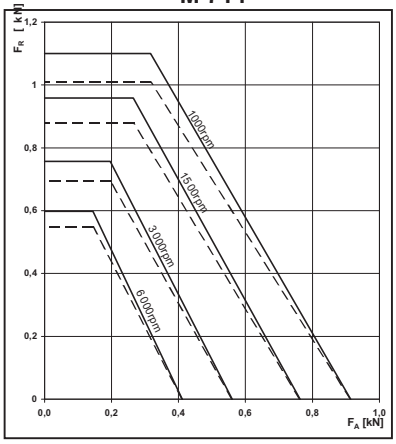
DIN 6885



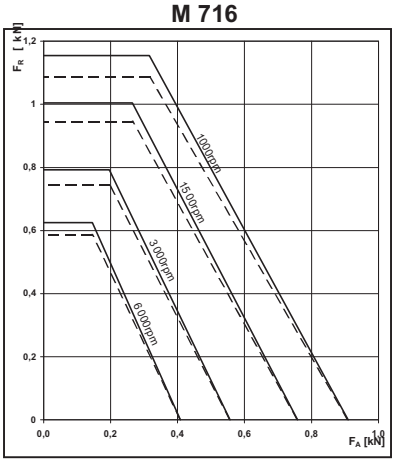
DIN 6885

♦ Radiální a axiální zatížení volného konce ♦ Radial and axial shaft load capacity ♦ ♦ Zulässige Radial- und Axialbelastungen der Wellenenden ♦

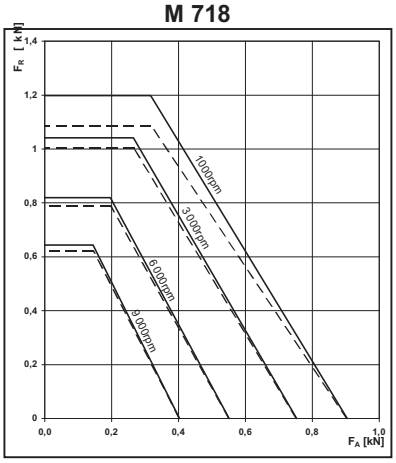
M 714



M 716

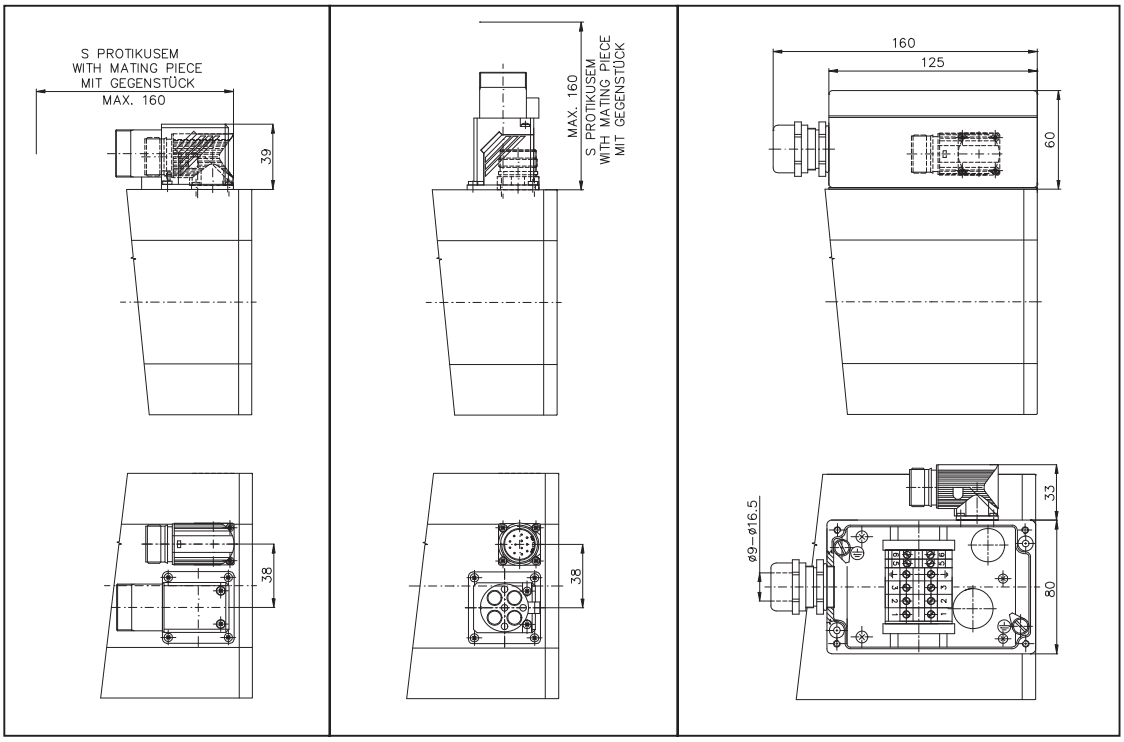


M 718

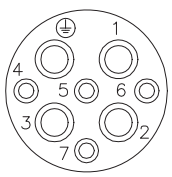


na konci hřídele / on the end of the shaft / auf welle ende
uprostřed hřídele / in the middle of the shaft / in mitte der welle

♦ Konektory ♦ Connectors ♦ Stecker ♦



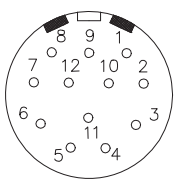
Motorový konektor
Power connector
Motorstecker



1 U
2 V
3 W
4 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse
⏚ GND

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

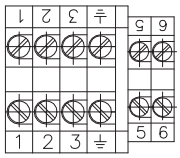
Signální konektor
Signal connector
Signalstecker



1 S1
2 S3
3 S4
4 S2
5 R1
6 R2
7,8 Teplotní spínač
Termoswitch
Termoschalter

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Svorkovnice
Terminal box
Klemme



1 U
2 V
3 W
4 GND
5 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse

Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

Technical data of servomotors

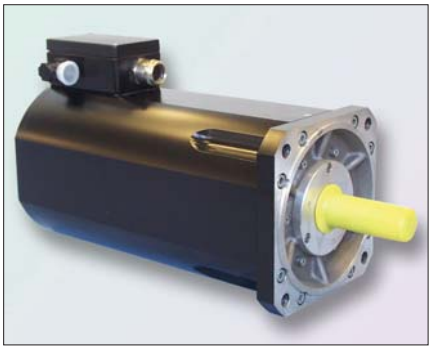
TYPE OF THE MOTOR				M713F	M713I	M713J	M713K	M713K	M713L	M713R	M714F	M714F	M714I	M714K	M714K	M714N	M714R
Voltage of intermediate circuit of converter		U_{DC}	V	330	560	560	330	560	560	560	330	560	560	330	560	560	560
S	STANDSTILL VALUES																
	Standstill torque	M_0	Nm	10	10	10	10	10	10	10	16	16	16	16	16	16	16
	Standstill current	I_0	A	13,7	6,7	6,05	8,64	8,64	5,04	2,42	22	22	10,75	13,8	13,8	6,45	3,87
	Torque constant	k_M	Nm/A	0,73	1,489	1,654	1,158	1,158	1,98	4,135	0,728	0,728	1,489	1,158	1,158	2,48	4,135
N	RATED VALUES OF THE MOTOR																
	Rated voltage	$U_{N\ MOT}$	V	143	294	227	157	228	270	239	142	210	292	157	231	254	239
	Rated torque	M_N	Nm	7,59	7,59	8,40	8,40	8	8,40	9,40	14,27	13,4	14	14,8	14,3	15	15,6
	Rated current	I_N	A	11	5,33	5,2	7,46	6,85	4,35	2,3	20,48	20	10,0	13,20	12,87	6,2	3,81
	Rated speed	n_N	min^{-1}	3000	3000	2000	2000	3000	2000	750	3000	4500	3000	2000	3000	1500	750
	Rated power output	P_N	W	2385	2385	1758	1758	2385	1758	738	4482	6314	4482	3109	4482	2377	1223
	Voltage constant	K_E	Vmin/1000	44	90	100	70	70	120	250	44	44	90	70	70	150	250
	Voltage constant	k_e	Vs/rad	0,420	0,860	0,955	0,668	0,668	1,150	2,387	0,420	0,420	0,860	0,67	0,668	1,432	2,387
Ü	OVERLOADING CAPACITY AT RATED SPEED																
	Overloading capacity at rated speed	M_0	Nm	22,82	13,42	24,68	18,54	25,89	18,09	23,19	44	56,6	26,2	31,4	43,6	37,7	37,4
	Max. overloading capacity at rated speed	M_0/M_N	-	3	1,77	2,94	2,21	3,41	2,16	2,47	3,06	4,22	1,83	2,12	3,05	2,5	2,4
	VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1																
Max	MAX. VALUES OF THE MOTOR																
	Max. torque	M_{max}	Nm	38,5	38,5	38,5	38,5	38,5	38,5	38,5	62	62	62	62	62	62	62
	Max. current	I_{max}	A	60	33	29,7	38	38	25	10,7	90	90	47	60	60	28	18
	Max. speed	n_{mech}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
C	LIMIT POINT																
	Current	I_C	A	60	33	29,7	38	38	25	10,7	90	90	47	60	60	28	18
	Breakdown torque	M_C	Nm	37,86	38,0	38,1	38,13	37,82	38,17	38	61,25	60,66	61,42	61,6	61,31	61,69	61,88
	Speed	n_C	min^{-1}	2005	1439	1213	1138	2114	1030	379	2391	4260	1844	1207	2210	998	369
Nutz	MAX. UTILIZABLE PARAMETERS FOR S1																
	Max. utilizable speed	n_{nutz}	min^{-1}	4065	3390	3002	2462	4446	2487	1094	4051	7152	3401	2441	4341	1977	1092
	Max. utilizable torque	M_{nutz}	Nm	6,74	7,28	7,6	8,02	6,43	8	9,12	13,7	11,9	14,0	14,6	13,5	14,9	15,4
	Max. utilizable power output	P_{nutz}	W	2868	2584	2387	2069	2995	2085	1045	5794	8887	4998	3729	6133	3076	1757
O	NO-LOAD RUNNING (I and M = 0)																
	No-load speed	n_0	min^{-1}	4318	3667	3300	2714	4714	2750	1320	4318	7500	3667	2714	4714	2200	1320
	TECHNICAL FEATURES																
	Number of poles	p	-	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Resistance of winding	R_{U-V}	Ω	0,37	1,62	2,15	0,95	0,95	3,30	14	0,157	0,157	0,70	0,49	0,489	2,09	8,84
	Inductance of winding	L_{U-V}	mH	4	17,89	23,30	10,6	10,60	30,00	142	2,15	2,15	11	6,47	6,474	27,94	79,85
	Moment of inertia	J	$kgm^2/1000$	0,86	0,86	0,86	0,86	0,86	0,86	0,86	1,4	1,4	1,4	1,4	1,4	1,4	1,4
	Mass	m	kg	13	13	13	13	13	13	13	17,5	17,5	17,5	17,5	17,5	17,5	17,5
	Axial load	F_A	N	268	268	320	320	320	320	433	268	268	268	320	320	433	433
	Radial load	F_R	N	908	908	1042	1042	1042	1042	1319	965	965	965	1108	1108	1403	1403
	Average speed	n_{mitt}	min^{-1}	1500	1500	1000	1000	1000	1000	500	1500	1500	1500	1000	1000	500	500
	MECHANICAL VALUES OF THE MOTOR																
	Static friction torque	M_r	Nm	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,20	0,20	0,20	0,20	0,20	0,20	0,20
	Damping constant	k_D	$Nm.min.10^{-5}$	3,7	3,7	3,7	3,7	3,7	3,7	3,7	9	9	9	9	9	9	9
	Mechanical time constant	T_m	ms	0,9	0,94	1,01	0,92	0,92	1,08	1,06	0,64	0,64	0,66	0,77	0,77	0,72	1,1
	THERMAL VALUES OF THE MOTOR																
	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W	0,59	0,57	0,59	0,63	0,58	0,56	0,57	0,33	0,24	0,32	0,37	0,30	0,42	0,33
	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W	0,47	0,46	0,48	0,51	0,47	0,45	0,46	0,27	0,19	0,26	0,30	0,25	0,34	0,27
	Thermal time constant	T_{th}	min	68,9	67,3	69,0	74,0	68,4	66,0	67,5	52,2	37,2	50,8	57,3	47,5	65,2	51,7
	COOLER																
	Quantity of water	Q_W	$dm^3.min^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rated pressure of water	p_N	kPa	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quantity of air	Q_L	$dm^3.s^{-1}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-

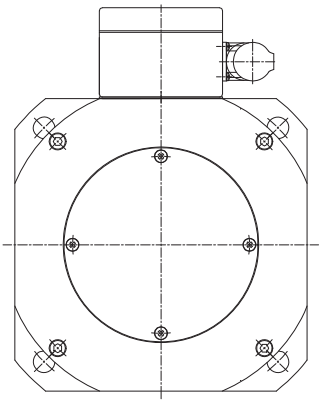
Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

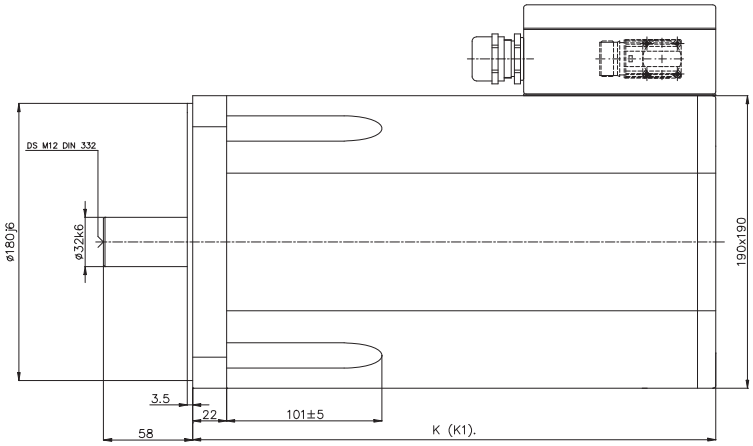
Technical data of servomotors

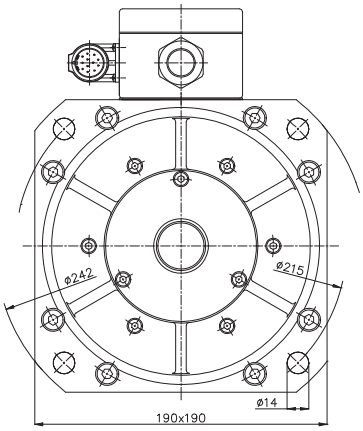
M716H	M716H	M716I	M716I	M716K	M716N	M718 F	M718 H	M718 H	M718 I	M718 L	M718 N	M718 T	TYPE OF THE MOTOR		
330	560	330	560	560	560	330	330	560	560	560	560	560	Voltage of intermediate circuit of converter	U_{DC}	V
													S STANDSTILL VALUES		
21	21	21	21	21	21	27	27	27	27	27	27	27	Standstill torque	M_0	Nm
21,16	21,16	14,11	14,11	18,1	8,5	37,1	27,21	27,21	18,15	13,6	10,9	3,3	Standstill current	I_0	A
0,992	0,992	1,489	1,489	1,158	2,48	0,728	0,992	0,992	1,488	1,985	2,48	8,27	Torque constant	k_M	Nm/A
													N RATED VALUES OF THE MOTOR		
130	281	146	284	228	246	137	127	275	280	253	242	291	Rated voltage	$U_{N\ MOT}$	V
18	14,2	18,7	16	16	18,7	16,5	20,0	11,2	16,5	20	22	25	Rated torque	M_N	Nm
18,64	15,28	12,86	11,55	14,85	7,72	23,65	20,73	12,07	11,56	10,36	8,95	3,07	Rated current	I_N	A
2000	4500	1500	3000	3000	1500	3000	2000	4500	3000	2000	1500	500	Rated speed	n_N	min^{-1}
3765	6688	2942	5172	5172	2942	5174	4185	5281	5174	4185	3414	1322	Rated power output	P_N	W
60	60	90	90	70	150	44	60	60	90	120	150	500	Voltage constant	K_E	Vmin/1000
0,573	0,573	0,859	0,86	0,668	1,432	0,42	0,573	0,573	0,859	1,146	1,432	4,775	Voltage constant	k_e	Vs/rad
													Ü OVERLOADING CAPACITY AT RATED SPEED		
63,6	36	52,0	37,3	53,8	54,3	61,9	79,6	41,4	41,8	52,4	68,4	44,1	Overloading capacity at rated speed	M_0	Nm
3,53	2,55	2,78	2,26	3,26	2,9	3,75	3,98	3,7	2,53	2,62	3,15	1,75	Max. overloading capacity at rated speed	M_0/M_N	-
VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1															
													Max MAX. VALUES OF THE MOTOR		
81	81	81	81	81	81	104	104	104	104	104	104	104	Max. torque	M_{max}	Nm
93	93	62	62	80	37	180	120	120	88	60	48	14,4	Max. current	I_{max}	A
6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	Max. speed	n_{mech}	min^{-1}
													C LIMIT POINT		
93	93	62	62	80	37	180	120	120	88	88	48	14,4	Current	I_C	A
78,7	76,9	79,5	78,3	78,2	79,5	96,3	98,0	93,2	97,4	100,0	100,0	103,1	Breakdown torque	M_C	Nm
1685	3072	1118	2043	2111	1123	2153	1695	3042	1847	1116	1122	263	Speed	n_C	min^{-1}
													Nutz MAX. UTILIZABLE PARAMETERS FOR S1		
2982	5314	1972	3504	4439	2045	4226	3053	5446	3565	2642	2083	577	Max. utilizable speed	n_{nutz}	min^{-1}
16,5	13,0	18,0	15,7	14,3	17,9	12,2	16,3	7,9	14,5	17,7	19,7	25,0	Max. utilizable torque	M_{nutz}	Nm
5149	7212	3721	5761	6640	3835	5385	5207	4497	5409	4905	4294	1509	Max. utilizable power output	P_{nutz}	W
													O NO-LOAD RUNNING (I and M = 0)		
3167	5500	2111	3667	4714	2200	4318	3167	5500	3667	2750	2200	660	No-load speed	n_0	min^{-1}
													TECHNICAL FEATURES		
6	6	6	6	6	6	6	6	6	6	6	6	6	Number of poles	p	-
0,2	0,2	0,41	0,41	0,31	1,23	0,08	0,15	0,15	0,30	0,54	0,81	8,693	Resistance of winding	R_{U-V}	Ω
2,8	2,8	6,3	6,30	5,24	18,6	1,26	2,26	2,26	5,16	8,71	14,77	142,9	Inductance of winding	L_{U-V}	mH
1,86	1,86	1,86	1,86	1,86	1,86	2,36	2,36	2,36	2,36	2,36	2,36	2,36	Moment of inertia	J	$kgm^2/1000$
21	21	21	21	21	21	27	27	27	27	27	27	27	Mass	m	kg
320	320	433	433	268	433	260	310	310	260	310	420	420	Axial load	F_A	N
1187	1187	1506	1506	1033	1506	1020	1180	1180	1020	1180	1500	1500	Radial load	F_R	N
1000	1000	500	500	1500	500	1500	1000	1000	1500	1000	500	500	Average speed	n_{mitt}	min^{-1}
													MECHANICAL VALUES OF THE MOTOR		
0,31	0,31	0,31	0,31	0,31	0,31	0,37	0,37	0,37	0,37	0,37	0,37	0,37	Static friction torque	M_r	Nm
13	13	13	13	13	13	17	17	17	17	17	17	17	Damping constant	k_D	$Nm.min.10^{-5}$
0,57	0,57	0,52	0,52	0,65	0,56	0,56	0,57	0,57	0,5	0,47	0,49	0,47	Mechanical time constant	T_m	ms
													THERMAL VALUES OF THE MOTOR		
0,35	0,19	0,41	0,28	0,26	0,39	0,26	0,33	0,17	0,26	0,34	0,38	0,45	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W
0,28	0,15	0,33	0,23	0,21	0,32	0,21	0,26	0,14	0,21	0,27	0,31	0,36	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W
68,6	37,1	80,4	55,7	51,7	77,0	60,6	76,9	40,0	61,9	80,2	90,8	105,6	Thermal time constant	T_{th}	min
													COOLER		
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of water	Q_W	$dm^3.min^{-1}$
-	-	-	-	-	-	-	-	-	-	-	-	-	Rated pressure of water	p_N	kPa
-	-	-	-	-	-	-	-	-	-	-	-	-	Quantity of air	Q_L	$dm^3.s^{-1}$

M 904
M 906









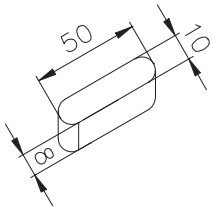
TYP SERVOMOTORU	MOTOR TYPE	MOTORTYP	M 904	M 906
K (bez brzdy)	**K** (without brake)	**K** (ohne bremse)	340	415
K1 (s brzdou)	**K1** (with brake)	**K1** (mit bremse)	390	465

♦ Brzda ♦ Brake ♦ Bremse ♦

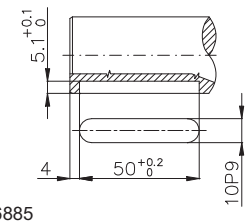
SERVOMOTOR	M_0 [Nm]	BINDER	M_B [Nm]	t_{1max} [ms]	t_{2max} [ms]	U_{1DC} [V]	n_{max} [min^{-1}]	J [$kg.m^2.10^{-3}$]	m [kg]
M 904 - B	35		16-32	90	45	24	3500	0,6	3,7
M 906 - B	55								

M_B - brzdný moment / holding torque / Haltemoment;
J - moment setrvačnosti / moment of inertia / Trägheitsmoment;
m - hmotnost / weight / Gewicht;
n_{MAX} - max. otáčky / max. speed / max. Drehzahl;
t_{1MAX} - max. čas sepnutí (odbrždění) / max. time of switching-on (brake release) / max. Einschaltzeit (lösung der Bremse);
t_{2MAX} - max.čas rozepnutí / max.time of switching-off / max.Ausschaltenzeit;
U_{1DC} - jmenovité napětí / rated voltage / Eingangsspannung;

♦ Hřídel ♦ Shaft ♦ Welle ♦



DIN 6885



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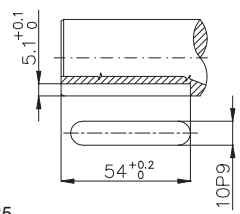
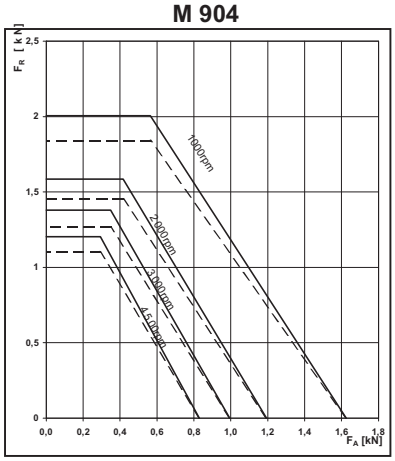


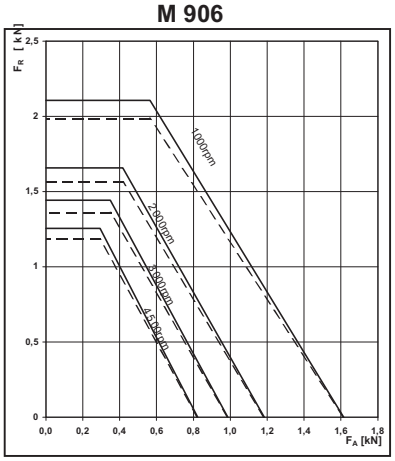
DIN 6885

♦ Radiální a axiální zatížení volného konce ♦ Radial and axial shaft load capacity ♦ ♦ Zulässige Radial- und Axialbelastungen der Wellenenden ♦

M 904

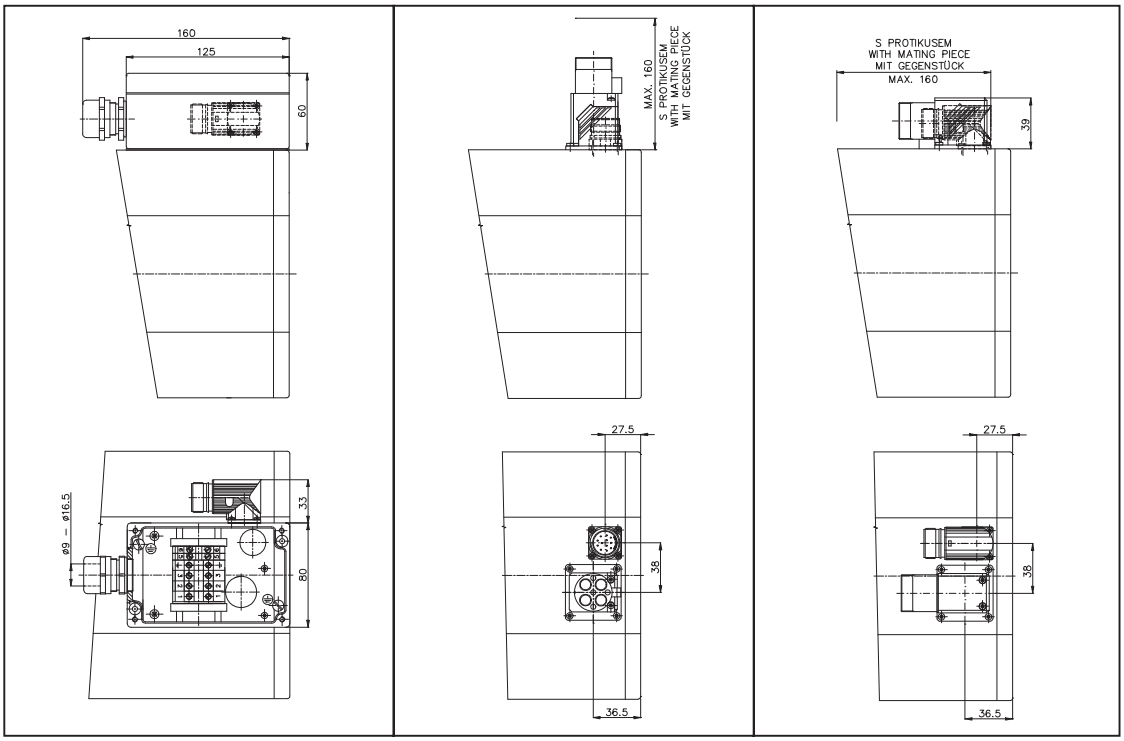


M 906

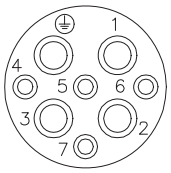


na konci hřídele / on the end of the shaft / auf welle ende
uprostřed hřídele / in the middle of the shaft / in mitte der welle

♦ Konektory ♦ Connectors ♦ Stecker ♦



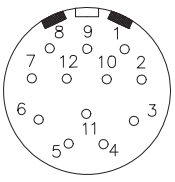
Motorový konektor
Power connector
Motorstecker



1 U
2 V
3 W
4 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse
⏚ GND

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

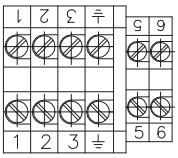
Signální konektor
Signal connector
Signalstecker



1 S1
2 S3
3 S4
4 S2
5 R1
6 R2
7,8 Teplotní spínač
Termoswitch
Termoschalter

Strana pájení protikusu konektoru
Ansicht Gegenstecker-Lötseite
View from solder side of mating plugs

Svorkovnice
Terminal box
Klemme



1 U
2 V
3 W
4 GND
5 Brzda / Brake / Bremse
6 Brzda / Brake / Bremse

Typ Type Typ	M 25	M 40	M 50	M 71	M 90	F 50	F 63	F 80	F 100	W 25	W 40
	W 50	W 71	W 90	ML 40	ML 50	ML 71	ML 90	MA 40	MA 50	ME	FE

Technical data of servomotors

TYPE OF THE MOTOR				M 9 0 4 F	M 9 0 4 H	M 9 0 4 I	M 9 0 4 J	M 9 0 4 K	M 9 0 4 K	M 9 0 4 L	M 9 0 4 N	M 9 0 4 P	M 9 0 6 H
Voltage of intermediate circuit of converter		U_{DC}	V	330	330	560	560	330	560	560	560	560	330
S	STANDSTILL VALUES												
	Standstill torque	M_0	Nm	35	35	35	35	35	35	35	35	35	55
	Standstill current	I_0	A	47,0	35,3	23,5	21,2	30,2	30,2	17,6	14,1	10,6	55,4
	Torque constant	k_M	Nm/A	0,744	0,992	1,488	1,654	1,158	1,158	1,985	2,480	3,300	0,992
N	RATED VALUES OF THE MOTOR												
	Rated voltage	$U_{N\,MOT}$	V	143	129	285	213	149	219	257	245	226	129
	Rated torque	M_N	Nm	24,7	28,1	24,7	28,1	28,1	24,7	28,1	29,9	31,6	37,9
	Rated current	I_N	A	34,7	29,2	17,3	17,5	25,0	22,3	14,6	12,3	9,7	39,3
	Rated speed	n_N	min^{-1}	3000	2000	3000	2000	2000	3000	2000	1500	1000	2000
	Rated power output	P_N	W	7762	5893	7762	5893	5893	7762	5893	4689	3306	7929
	Voltage constant	K_E	Vmin/1000	45	60	90	100	70	70	120	150	200	60
	Voltage constant	k_e	Vs/rad	0,430	0,573	0,859	0,955	0,668	0,668	1,146	1,432	1,910	0,573
Ü	OVERLOADING CAPACITY AT RATED SPEED												
	Overloading capacity at rated speed	$M_Ü$	Nm	68,0	81,4	48,4	91,1	70,2	91,4	66,9	72,3	80,8	131,8
	Max. overloading capacity at rated speed	$M_Ü/M_N$	-	2,75	2,90	1,96	3,24	2,49	3,70	2,38	2,42	2,56	3,48
	VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1												
Max	MAX. VALUES OF THE MOTOR												
	Max. torque	M_{max}	Nm	105	105	105	105	105	105	105	105	105	181
	Max. current	I_{max}	A	179	140	93	84	120	120	68	56	42	181
	Max. speed	n_{mech}	min^{-1}	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
C	LIMIT POINT												
	Current	I_C	A	179	140	93	84,0	120,0	120,0	68,0	56	42	181
	Breakdown torque	M_C	Nm	100,67	101,86	101,3	101,5	102,0	99,6	102,2	102,85	103,51	166,34
	Speed	n_C	min^{-1}	2264	1640	1952	1820	1577	2819	1485	1122	777	1654
Nutz	MAX. UTILIZABLE PARAMETERS FOR S1												
	Max. utilizable speed	n_{nutz}	min^{-1}	4055	2998	3503	3154	2586	4596	2597	2050	1499	3031
	Max. utilizable torque	M_{nutz}	Nm	21,09	24,71	22,98	24,2	26,1	19,2	26,1	27,97	29,86	29,02
	Max. utilizable power output	P_{nutz}	W	8955	7759	8431	7987	7076	9256	7095	6004	4687	9210
O	NO-LOAD RUNNING (I and M = 0)												
	No-load speed	n_0	min^{-1}	4222	3167	3667	3300	2714	4714	2750	2200	1650	3167
	TECHNICAL FEATURES												
	Number of poles	p	-	6	6	6	6	6	6	6	6	6	6
	Resistance of winding	R_{U-V}	Ω	0,05	0,10	0,218	0,24	0,13	0,13	0,35	0,534	1,10	0,06
	Inductance of winding	L_{U-V}	mH	1,2	2,1	4,6	5,37	2,35	2,35	8,10	13,13	24,73	1,63
	Moment of inertia	J	$kgm^2/1000$	5,48	5,2	5,2	5,2	5,48	5,48	5,48	5,2	5,2	8,13
	Mass	m	kg	34	33	33	33	34	34	34	33	33	45,5
	Axial load	F_A	N	417	564	473	564	417	417	417	764	764	418
	Radial load	F_R	N	1454	1994	1735	1994	1454	1454	1454	2525	2525	1564
	Average speed	n_{mitt}	min^{-1}	2000	1000	1500	1000	2000	2000	2000	500	500	2000
	MECHANICAL VALUES OF THE MOTOR												
	Static friction torque	M_r	Nm	0,41	0,41	0,41	0,41	0,41	0,41	0,41	0,41	0,41	0,46
	Damping constant	k_D	$Nm.min.10^{-5}$	15	15	15	15	15	15	15	15	15	23
	Mechanical time constant	T_m	ms	0,76	0,79	0,71	0,68	0,78	0,78	0,73	0,67	0,79	0,71
	THERMAL VALUES OF THE MOTOR												
	Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W	0,23	0,28	0,23	0,30	0,29	0,23	0,30	0,33	0,33	0,25
	Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W	0,19	0,23	0,19	0,24	0,23	0,19	0,24	0,27	0,26	0,20
	Thermal time constant	T_{th}	min	80,4	97,8	79,0	103,5	99,1	79,9	101,7	113,5	111,9	115,7
	COOLER												
	Quantity of water	Q_W	$dm^3.min^{-1}$	-	-	-	-	-	-	-	-	-	-
	Rated pressure of water	p_N	kPa	-	-	-	-	-	-	-	-	-	-
	Quantity of air	Q_L	$dm^3.s^{-1}$	-	-	-	-	-	-	-	-	-	-

Technical data of servomotors

M906H	M906I	M906J	M906K	M906K	M906L	M906N	M906O	M906R	M906T	TYPE OF THE MOTOR			
560	560	560	330	560	560	560	560	560	560	Voltage of intermediate circuit of converter		U_{DC}	V
										S	STANDSTILL VALUES		
55	55	55	55	55	55	55	55	55	55		Standstill torque	M_0	Nm
55,4	37,0	33,3	47,5	47,5	27,7	22,2	18,5	13,3	6,7		Standstill current	I_0	A
0,992	1,488	1,654	1,158	1,158	1,985	2,480	2,977	4,130	8,270		Torque constant	k_M	Nm/A
										N	RATED VALUES OF THE MOTOR		
188	278	308	148	217	253	239	290	271	284		Rated voltage	$U_{N\ MOT}$	V
29,3	26,3	26,3	37,9	29,3	35,9	40,7	42,1	45,4	50,2		Rated torque	M_N	Nm
30,8	18,5	16,6	33,7	26,4	18,6	16,7	14,5	11,1	6,1		Rated current	I_N	A
3000	3000	3000	2000	3000	2000	1500	1500	1000	500		Rated speed	n_N	min^{-1}
9200	8263	8263	7929	9200	7512	6386	6620	4758	2629		Rated power output	P_N	W
60	90	100	70	70	120	150	180	250	500		Voltage constant	K_E	Vmin/1000
0,573	0,859	0,955	0,668	0,668	1,146	1,432	1,719	2,390	4,770		Voltage constant	k_e	Vs/rad
										Ü	OVERLOADING CAPACITY AT RATED SPEED		
150,5	71,8	46,5	106,1	131,9	103,4	139,7	80,7	102,4	93,4		Overloading capacity at rated speed	$M_Ü$	Nm
5,14	2,73	1,77	2,80	4,51	2,88	3,43	1,92	2,26	1,86		Max. overloading capacity at rated speed	$M_Ü/M_N$	-
										VALUES OF THE MOTOR AT MAX. SUPPLY VOLTAGE U_1			
										Max	MAX. VALUES OF THE MOTOR		
181	181	181	181	181	181	181	181	181	181		Max. torque	M_{max}	Nm
181	142	128	180	180	107	85	66	51	25		Max. current	I_{max}	A
4500	4500	4500	4500	4500	4500	4500	4500	4500	4500		Max. speed	n_{mech}	min^{-1}
										C	LIMIT POINT		
181	142	128	180	180	107	85	66	51	25		Current	I_C	A
155,12	163,97	165	168	158	168,37	169,24	172,13	174,66	178,1		Breakdown torque	M_C	Nm
2921	1922	1795	1485	2633	1425	1327	1001	716	328		Speed	n_C	min^{-1}
										Nutz	MAX. UTILIZABLE PARAMETERS FOR S1		
5474	3599	3228	2612,09	4670,39	2653	2113	1721	1233	589		Max. utilizable speed	n_{nutz}	min^{-1}
8,08	21	24,12	32,61	14,97	29,6	34,8	40,2	43,2	49,4		Max. utilizable torque	M_{nutz}	Nm
4629	7753	8154	8920	7319	8230	7697	7254	5580	3047		Max. utilizable power output	P_{nutz}	W
										O	NO-LOAD RUNNING (I and M = 0)		
5500	3667	3300	2714	4714	2750	2200	1833	1320	660		No-load speed	n_0	min^{-1}
											TECHNICAL FEATURES		
6	6	6	6	6	6	6	6	6	6		Number of poles	p	-
0,06	0,12	0,1247	0,066	0,066	0,207	0,43	0,457	0,80	3,26		Resistance of winding	R_{U-V}	Ω
1,63	3,12	3,65	1,77	1,77	5,515	6,3	12	21	77,53		Inductance of winding	L_{U-V}	mH
8,13	7,8	7,8	8,13	8,13	7,8	7,8	8,13	7,8	7,8		Moment of inertia	J	$kgm^2/1000$
45,5	45,5	45,5	45,5	45,5	45,5	45,5	45,5	45,5	45,5		Mass	m	kg
418	473	473	418	418	564	564	564	764	764		Axial load	F_A	N
1564	1829	1829	1564	1564	2109	2109	2109	2679	2679		Radial load	F_R	N
2000	1500	1500	2000	2000	1000	1000	1000	500	500		Average speed	n_{mitt}	min^{-1}
											MECHANICAL VALUES OF THE MOTOR		
0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46		Static friction torque	M_r	Nm
23	23	23	23	23	23	23	23	23	23		Damping constant	k_D	$Nm.min.10^{-5}$
0,71	0,63	0,53	0,60	0,60	0,62	0,82	0,63	0,55	0,56		Mechanical time constant	T_m	ms
											THERMAL VALUES OF THE MOTOR		
0,20	0,21	0,22	0,26	0,21	0,27	0,25	0,28	0,32	0,31		Thermal resistance (winding–ambient atm.)	$R_{th(RU)}$	K/W
0,16	0,17	0,18	0,21	0,17	0,22	0,20	0,23	0,26	0,25		Thermal resistance (frame–ambient atm.)	$R_{th(GU)}$	K/W
94,1	100,1	102,2	123,8	97,3	125,9	115,4	131,3	149,3	147,6		Thermal time constant	T_{th}	min
											COOLER		
-	-	-	-	-	-	-	-	-	-		Quantity of water	Q_W	$dm^3.min^{-1}$
-	-	-	-	-	-	-	-	-	-		Rated pressure of water	p_N	kPa
-	-	-	-	-	-	-	-	-	-		Quantity of air	Q_L	$dm^3.s^{-1}$